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SELECTING TECHNICAL INFORMATION PRESENTATION MODES ACCORDING TO--ETC(U)
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LEVEL III

Selecting Technical Information Presentation Modes According To Personnel Characteristics of Users And The Nature of Job Task Information

Part IV: Validation of Hypotheses

by

Thomas E. Powers, Ph.D.
University of Maryland Baltimore County

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Submitted To

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March 1978

Navy Technical Information
Presentation Program

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This report describes a study which assessed the validity of a series of hypotheses developed for selecting technical information presentation modes (visual formats) according to the characteristics of Navy technicians and the kinds of job task information used to perform technical job tasks. The hypotheses relate three components (job task information, personnel characteristics, and presentation modes), and each component is divided into subcomponents (parts) as follows: (1) Job Task Information: (a) nomenclature,

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20. terms, codes, and jargon, in an occupational specialty; (b) names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware; (c) fundamental facts, basic names, and locations of components and component parts of equipment/hardware; (d) the meaning of technical symbols, acronyms and abstract terms; (e) the functions of components and component parts of equipment/hardware; (f) how components and component parts relate to the entire equipment/hardware system; (g) theory and principles of operation of equipment/hardware, its components, or component parts; (h) how to use hand tools and testing equipment in maintaining equipment/hardware; (i) basic safety rules or special safety precautions for working on equipment/hardware; (j) procedures: that is, procedures for assembling/disassembling, troubleshooting, testing, maintenance, etc. of equipment/hardware; (k) calibrations, settings, torques, clearances, etc.; and (l) visual representations of the operational processes of complex circuiting (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.); (2) Characteristics: (a) Aptitude, (b) Education, (c) Pay Grade, and (d) Rating; and (3) Presentation Modes; (a) Photograph, (b) Drawing, (c) Diagram, (d) Graph, (e) Matrix, (f) Table, and (g) Text. Hypotheses are presented about relationships among the sub-components, and findings from a survey of the format preferences of Navy technicians are used as a preliminary check of the validity of the hypotheses. A final section of the report deals with tentative conclusions about the findings.

Acknowledgements

A number of individuals and Navy Commands are acknowledged for the immense amount of time and cooperation they gave to this study. The main contributors to whom I am greatly indebted are: (1) Mr. Samuel C. Rainey, Mr. Joseph J. Fuller, and Ms. Sid A. Yearick of the Navy Technical Information Presentation Program (NTIPP) Office at the David W. Taylor Naval Ship R & D Center, Bethesda, Maryland; (2) the Commanding Officers and many petty officers who participated in the survey conducted at the following Commands: (a) Combat Systems Technical Schools Command, Vallejo, CA; (b) Fleet ASW Training Center Pacific, San Diego, CA; (c) Fleet Training Center, Norfolk, VA; Naval Air Station, San Diego, CA; (d) Naval Air Technical Training Command, Millington, TN; (e) Naval Construction Training Center, Port Hueneme, CA; (f) Navy Torpedo Station, Keyport, WN; (g) Service School Command, Great Lakes, IS; and Service School Command, San Diego, CA; and (3) Ms. Jeannette A. Zerhusen and Ms. Kathleen M. Powers for many services performed in editing, revising, and preparing the final report.

Thomas E. Powers, Ph.D.

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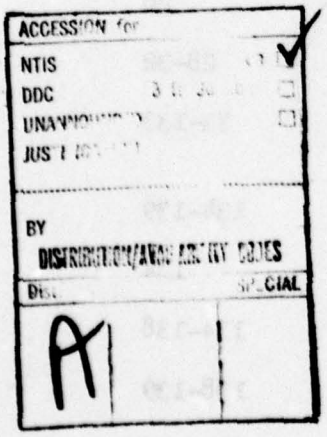

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I. INTRODUCTION

A. Background

Complaints from many Navy activities have indicated that a significant number of Navy technical manuals (TMs) are defective. One major defect in many TMs has been the poor quality of presentation modes[1] for transmitting information essential to the performance of operator and maintenance tasks. A common criticism is that many TMs are difficult to use. Writing levels are not matched to user abilities; there is an inadequate balance among "what to do," "how to do," and "why"; and formats are not standardized. Such defective TMs can have an adverse effect on Fleet operational readiness if these TMs are critical to the satisfactory performance of certain operator and maintenance tasks. The Navy Technical Information Presentation Program (NTIPP) was established as a major effort to find solutions to these problems.

A major assumption behind any endeavor to correct the kinds of defects described above is that there is a causal relationship between TM quality and user performance. That is, it is assumed that the capability of maintenance technicians to perform troubleshooting tasks on a piece of hardware, for example, is dependent in part upon the capability of the related technical manual to present troubleshooting procedures in a manner which is comprehensible to the technician.

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[1] For purposes of this research, the term "presentation mode" refers to any visual format used to transmit technical information (TI) to a technician.

This aspect of the TM question thus represents a technical information presentation problem. Specifically, a mismatch between the information vehicle (the TM) and the information user (the technician) results in unsatisfactory operation/maintenance performance -- from either the technician's misunderstanding or non-use of the TM.

This study employs instructional design concepts in dealing with the TM question, an approach which assumes that a TM is, in a broad sense, an instructional or learning vehicle. The following premise is adopted: If "learner" (technician) characteristics can be better matched with the "learning vehicle" through which information is presented (the TM), "learning" (operator and maintenance performance) will be more effective.

The instructional design concept which is most compatible with current Navy training philosophy and with contemporary practices in the vocational training community is Instructional Systems Development (ISD).[1] In its most simple form, an ISD approach defines learning in terms of observable performance, and attempts to establish congruity among the three major components of any learning process: the learner, the required learning performance, and the learning vehicle. The learning process may be described in terms of the three components: (1) Salient characteristics of the learner (ability, learning style, etc.) are matched with (2) the required learning as defined by precise descriptions of the cognitive/motor behaviors desired, and finally (3) the learning vehicle

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[1]See Interservice Procedures for Instructional Systems Development. NAVEDTRA 106A. August 1975. (Reference 6, p. 140. See p. 140 for a complete list of references.)

(which may be either an intricate instructional strategy or a more simplified medium/format combination for presenting information) is selected which is most suited to "1" in accomplishing "2." This requires congruity among the three components, and instructional design concepts are important tools in producing a valid relationship among them.

In summation, the process of correcting the information presentation problems associated with many TMs seem to be amenable to the ISD approach. That is, appropriate portions of a TM can be thought of as "learning" vehicles for eliciting the cognitive/motor responses desired for operator or maintenance job tasks.

B. Purpose

The overall purpose of this study is to establish a relationship among Navy enlisted personnel characteristics, technical job task information classifications, and the presentation modes used to transmit that job task information. Success in such an investigation would provide a basis for selecting presentation modes appropriate to the nature of job task information and variations in characteristics of job task performers.

The effort involves five principal endeavors as follows:

(1) Generic Job Task Information Classifications: The identification of those classifications of job task information, which are common to all or most Navy technical ratings and technical job tasks, and that information which is required for the performance of technical job tasks.

(2) Personnel Characteristics: The identification of trends and variations in the aptitudes (and other relevant characteristics) of Navy enlisted personnel differentiated by Navy occupation specialities

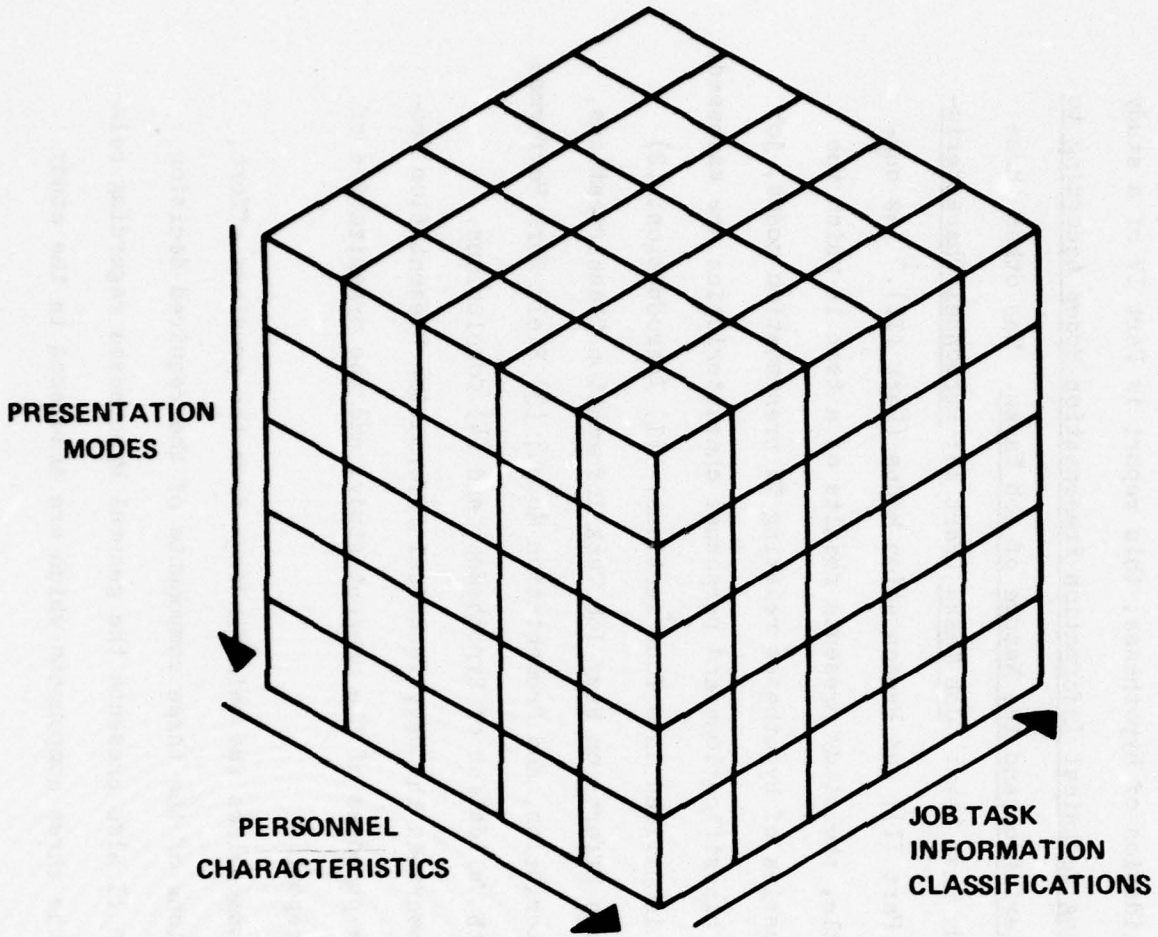
(occupation groups/ratings) and by pay grades.

(3) Presentation Modes: The identification of a useful inventory of visual formats for presenting technical information.

(4) Validation of Hypotheses: The investigation of preferences by Navy technicians for particular presentation modes for presenting various classifications of technical job task information.

(5) Decision Process: The development of a series of principles relating 1, 2, and 3 above for selecting presentation modes according to personnel characteristics and job task information classifications.

The following information has been developed: (1) descriptions of general job task information classifications requiring technical information presentation; (2) characteristics of personnel related to performance; and (3) an inventory of presentation modes distinguished by various visual format combinations. Tested statements describing interrelationships among the three components is the subject of this report. A series of hypotheses have been developed. When validated, they will provide the framework for the required decision process. An example of such a hypothesis is: A Navy technician with "personnel characteristic" A should be able to understand "job task information classification" 1 most effectively when such information is presented through "presentation modes" I and II. The aggregate of hypotheses can be displayed in terms of a three-dimensional structure (personnel characteristics, job tasks, presentation modes) in which each cubical cell could be associated with a level of match/mismatch among the three components. Figure 1 illustrates such a structure. Although "job environment" is another important component in any decision process which selects presentation modes, this study confines



*A LEVEL OF MATCH OR MISMATCH CAN BE ASSOCIATED WITH EACH CUBICAL CELL. LEVEL OF MATCH IS ULTIMATELY MEASURED IN TERMS OF A TECHNICIAN'S COMPREHENSION OF JOB TASK INFORMATION..

THREE DIMENSIONAL REPRESENTATION INDICATING MATCHING OF PRESENTATION MODES TO PERSONNEL CHARACTERISTICS AND CLASSIFICATIONS OF JOB TASKS INFORMATION*

itself to the influence of personnel characteristics and the nature of technical information in selecting the most effective presentation modes.

C. Report Organization

Entitled Validation of Hypotheses, this report is Part IV of a study entitled, Selecting Technical Information Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks. The other three parts to the study have been: Job Tasks (Part I); Personnel Characteristics, 2 volumes (Part II); and Presentation Modes (Part III).[1] As suggested by the title, the study presents results of a test in which the validation of a series of hypotheses relating TI presentation modes, job task information classifications and personnel characteristics are assessed.

This report is divided into four sections: (1) Introduction; (2) Summary of Previous Efforts on Navy Job Task Information Classifications, Personnel Characteristics, and Presentation Modes; (3) Field Work Performed in Connection with Validation of Hypotheses; and (4) Conclusions.

Section I describes the Navy Technical Information Presentation Program (NTIPP); the purposes of the present study; and the organization of this particular report.

Section II summarizes the main findings from the previous effort; that is, definitions of the three components of the required decision process. Section II also presents the general hypotheses regarding relationships among the three components which are assesssed in the study.

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[1] See reference 7, p. 140.

Section III reports a survey conducted at Navy sites which obtained information concerning the preferences of Navy technicians for various technical data formats for presenting different classifications of job task information. The analyses and findings concerning format preferences, differentiated by the characteristics (i.e., the ratings, pay grades, GCT[1] scores, and civilian education levels) of the personnel making the choices, provide the data for examining the validity of the hypotheses contained in Section II.

Section IV develops conclusions of the study. These are drawn from the validation survey (see Section III) and from the effort previously carried out in Parts I, II, and III.

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[1]GCT = General Classification Test. A test of one's general knowledge, GCT is one of the sub-tests included in the Basic Test Battery (BTB). Until 1 January 1976, when the Navy adopted the Armed Services Vocational Aptitude Battery (ASVAB), all enlisted personnel inducted into the Navy completed the BTB tests.

II. SUMMARY OF PREVIOUS EFFORTS ON NAVY JOB TASK INFORMATION CLASSIFICATIONS, PERSONNEL CHARACTERISTICS AND PRESENTATION MODES

A. Background

The decision process referred to in the Introduction is intended to serve as an instrument for making predictions about the kinds of presentation modes required by varying types of personnel so that they can best comprehend different classifications of job task information. In order to develop this instrument, it was first necessary to determine the nature of the relationships among the three components of the learning process: classifications of job task information, personnel characteristics, and presentation modes to provide data from which realistic hypotheses could be developed. Summaries of this effort are contained in the next three subsections. A final subsection depicts relationships among the component parts described and presents hypotheses regarding the relationships. The hypotheses represent an initial definition of how the decision scheme would be applied to the most effective selection of technical information (TI) presentation modes for Navy enlisted technicians, the users of the information.

B. Job Tasks[1]

Personnel from 30 Navy technical ratings were surveyed to determine the existence of classifications of job task information which would be

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[1] Findings contained in this subsection are taken from: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks, Part I Job Tasks. (See reference 7, p. 140.)

common to most, if not all, technical ratings. This was accomplished mainly through a questionnaire in which 452 petty officers (E4-E9) identified the specific knowledge and skills[1] required to perform technical jobs in each of seven technical job task categories found to be common to the ratings surveyed. The job task categories were:

1. Assembling/Disassembling
2. Testing/Repairing
3. Troubleshooting/Repairing
4. Cleaning/Lubricating
5. Adjusting/Aligning
6. Removing/Replacing
7. Operating/Securing

Most of the subjects in each rating surveyed reported the same knowledge and skill requirements for the job task categories employed in the survey. This finding suggested that it would be possible to classify all technical knowledge and skill required for job task performance through a common classification system. That is, classifications of technical information should exist which would be equally meaningful and useful to all technicians, regardless of their ratings or the category of job tasks each was performing.

From the analysis of responses to questions eliciting knowledge and skill requirements for technical job performance, six technical information classifications were initially developed. Although tentative, the six seemed to represent a practical way of classifying any technical information required by any technician performing any job task. The information

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[1]Findings contained in this subsection are taken from: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks, Part II: Personnel Characteristics. (See reference 7, p. 140.)

classifications, from simple to complex,[1] were:

1. Basic: Nomenclature, terms, codes, and jargon in an occupational specialty, as well as fundamental facts, names, and locations related to parts and components of equipment/hardware; meanings of technical symbols, visual cues, signals, and abstract terms.

2. Conjoint: Operational principles, functions, and relationships of parts and components of equipment/hardware systems.

3. Operational: Operating steps for simple/basic and complex/special hand tools, testing equipment, and principal equipment/hardware.

4. Procedural: Simple/basic and complex/special rules and procedures.

5. Multifactual: Lists and tables containing specific technical data, including descriptive information on calibrations, settings, torques, clearances, etc.

6. Configurative: Visual representations of functional/operational processes.

In a pre-test a questionnaire in which the six information classifications were to be used, many of the subjects reported that some of the above classifications were too broad. Therefore, the six classifications were sub-divided into twelve, and two subsequent pre-tests of a second questionnaire containing the 12 new information classifications proved to be successful. The new classifications adopted were:

1. Nomenclature, terms, codes, and jargon, in an occupational specialty. (Basic Information)

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[1]The term "simple" refers to information more easily recalled from memory; and "complex" to information less easily recalled from memory. Basic information was considered to have the least requirement for technical documentation; and configurative information, the greatest requirement.

2. Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware. (Basic Information)

3. Fundamental facts, basic names, and locations of components and component parts of equipment/hardware. (Basic Information)

4. The meaning of technical symbols, acronyms and abstract terms. (Basic Information)

5. The functions of components and component parts of equipment/hardware. (Conjoint Information)

6. How components and component parts relate to the entire equipment/hardware system. (Conjoint Information)

7. Theory and principles of operation of equipment/hardware, its components, or component parts. (Conjoint Information)

8. How to use hand tools and testing equipment in maintaining equipment/hardware. (Operational Information)

9. Basic safety rules or special safety precautions for working on equipment/hardware. (Procedural Information)

10. Procedures: That is, procedures for assembling/disassembling, troubleshooting, testing, maintenance, etc. of equipment/hardware. (Procedural Information)

11. Calibrations, settings, torques, clearances, etc. (Multifactual Information)

12. Visual representations of the operational processes of complex circuiting (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.) (Configurative Information)

For referral when reading later sections of this report, the descriptions of the twelve information classifications are duplicated in Appendix B.

C. Personnel Characteristics[1]

The purpose of the study of Navy enlisted personnel characteristics was mainly to assess the mental capabilities of sailors in today's highly technical Navy, and in particular to determine any variation in such capabilities by rating and pay grade, as well as to such factors as age, sex, and race. In making decisions regarding the selection of appropriate modes for presenting technical information required to perform technical job tasks, it was necessary to know the potential of technicians to comprehend technical information. Presumably, a major indicator of that potential would be the mental aptitudes and prior civilian education of technical personnel.

The main source of data for this study was the Enlisted Master Tapes (EMT's). Developed and maintained by the Chief of Naval Personnel, the EMT's contain personal and career information for each enlisted man on active duty in the Navy. Among the information recorded on the EMT's are the enlistee's date of birth, sex, race, home address, civilian education, enlistment date(s), rating, pay grade, aptitude scores, Navy schooling, military assignments, etc. Computer printout reports of some data from the EMT's are produced regularly by the Chief of Naval Personnel to examine personnel quality and strengths in the Navy.[2] In addition, as in this case,

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[1]Findings contained in this subsection are taken from: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks, Part II: Personnel Characteristics. (See reference 7, p. 140.)

[2]For example, Navy Military Personnel Statistics, NAVPERS 15658 is published quarterly to report information about strengths, accessions, attritions, enlistments, reenlistments, etc. in the Navy.

the Chief of Naval Personnel occasionally approves specific requests from Navy activities for access to certain EMT data, and in such cases a special computer program is written to extract the data required.

The Navy aptitude test scores used in this research are for the Basic Test Battery (BTB) and the Armed Services Vocational Aptitude Battery (ASVAB). For many years, the Navy's principal indicator of a sailor's mental potential was his scores on the BTB, particularly scores on three subtests: General Classification Test (GCT), Arithmetic Reasoning (ARI), and Mechanical Comprehension (MECH). The BTB was replaced by the ASVAB as the means for screening and classifying recruits in January 1976. Personnel presently inducted into the Navy are tested by ASVAB tests. The ASVAB subtests which correspond closely to the above subtests on the BTB are Word Knowledge (WK), Arithmetic Reasoning (AR) and, Mechanical Comprehension (MC) respectively.

Mental Aptitudes

The range in average GCT/WK scores was wide among existing Navy ratings at the end of FY 76. For example, CTI's had an average GCT/WK of 65, and MS's, 44. However, the average GCT/WK scores for the majority of ratings were in the range of 50-59. Among technical ratings,[1] the highest scores were attained by personnel in electrical/electronic ratings; the lowest, by personnel in mechanical ratings. See Figure 2 for average GCT/WK scores by ratings for enlisted personnel in the Navy at the end of FY 76.

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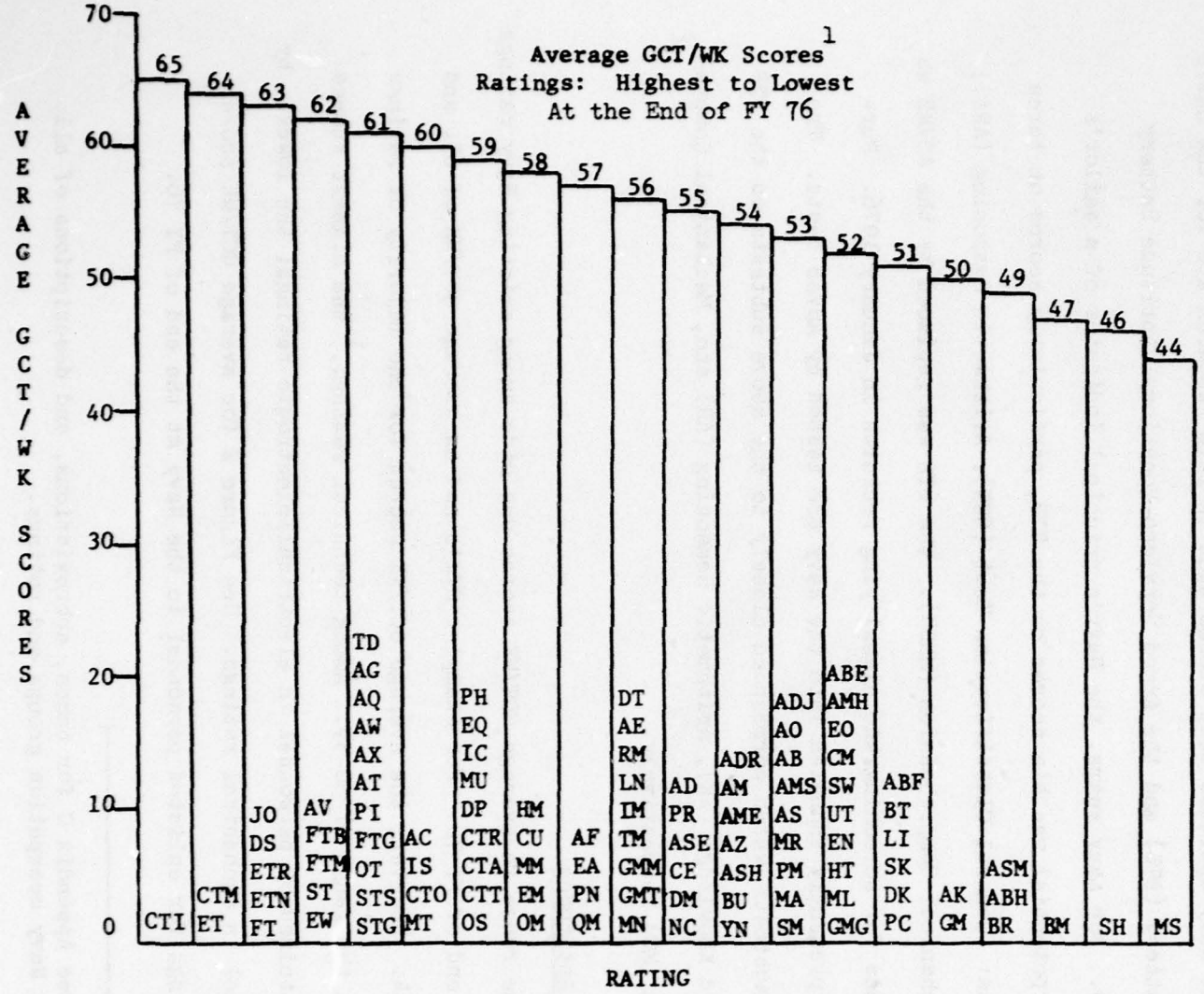
[1]See Appendix C for names, abbreviations, and descriptions of all current Navy occupation groups and ratings.

FIGURE 2



[1]GCT is for those tested in the first 6 months, and AR, for those tested in the 6 months of FY 76.

Source: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics And The Nature of Job Tasks, Part II: Personnel Characteristics, Volume 1: Summary and Analysis, p. 126.

The analysis of average scores for arithmetic reasoning (ARI and AR) also revealed wide differences by ratings. ET's, for example, had an average ARI/AR score of 63 at the end of FY 76, as compared to 46 for MS's. Among the technical ratings, electrical/electronic ratings once again tended to achieve the highest ARI/AR scores; mechanical ratings, the lowest. See Figure 3 for average ARI/AR scores by ratings for enlisted personnel in the Navy at the end of FY 76.

At the end of FY 76, mechanical aptitude (MECH and MC) scores varied greatly among ratings. FT's had the highest average score (59); MS's, the lowest (43). See Figure 4 for average MECH/MC scores by ratings for enlisted personnel in the Navy at the end of FY 76.

Civilian Education

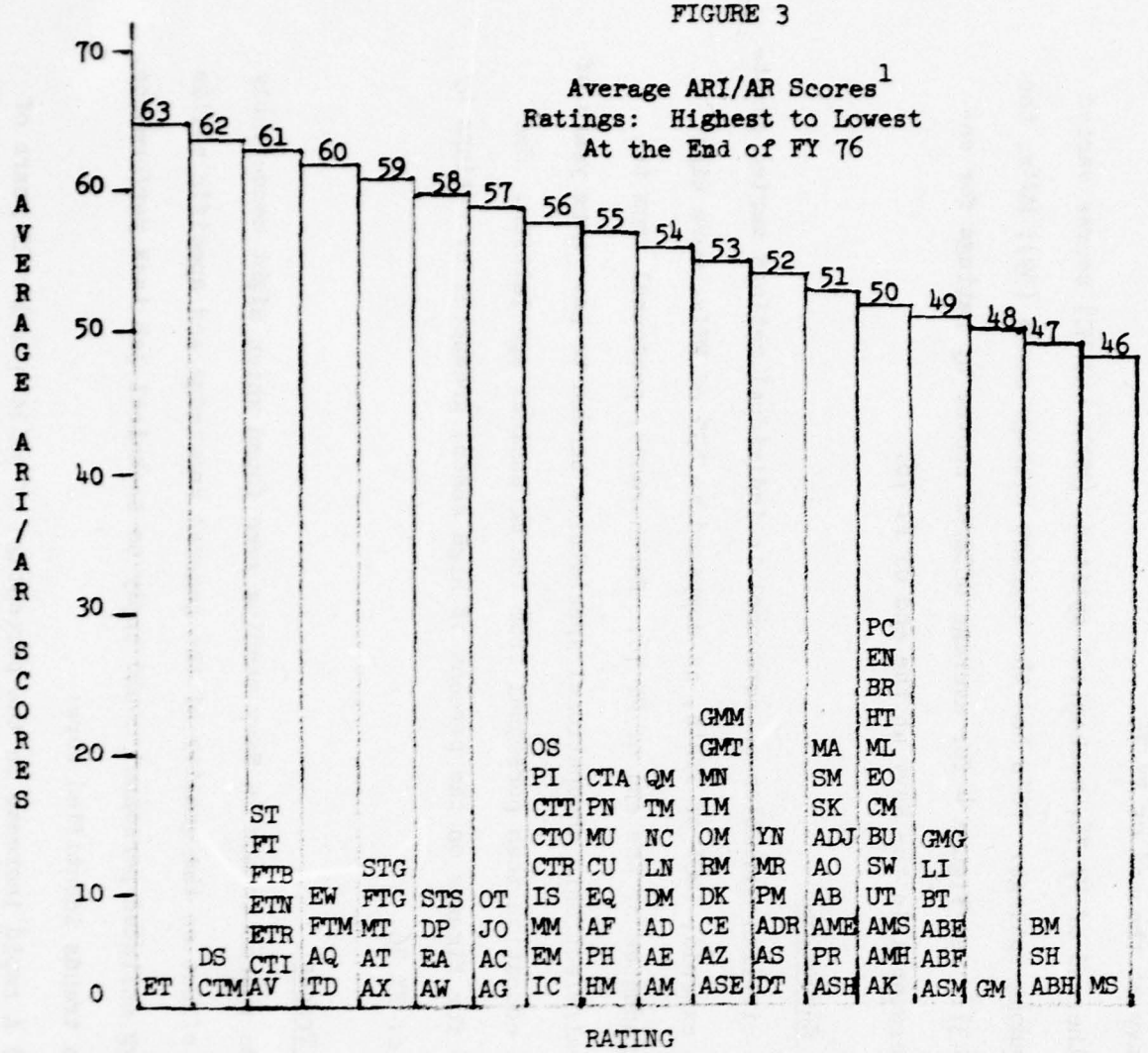
The civilian education of personnel in individual ratings varied greatly. For example, 100% of FTB's, as compared to 69% of BT's, were high school graduates by the end of FY 76. Furthermore, personnel from the electrical/electronic occupational specialties tended to have more years of civilian education than personnel from the mechanical specialties. See Figure 5 for figures on the percent of high school graduates by ratings by the end of FY 76.

Manning Trends

Some recent trends in Navy manning were found which might conceivably have an effect on the quality of the general knowledge and specific skills that Navy enlisted personnel could apply to technical job task performance. Two main trends identified were:

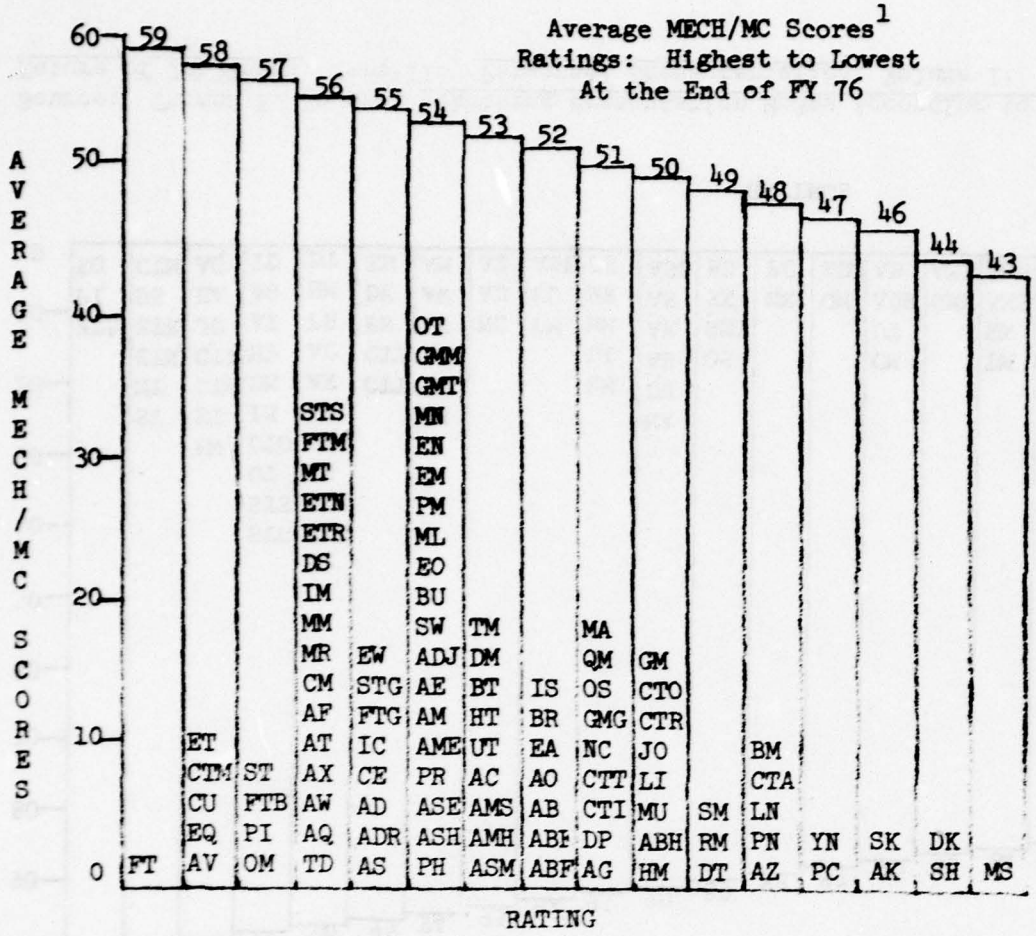
(1) A rapid increase in the percentage of sailors under 21 years of

FIGURE 3



[1]ARI is for those tested in the first 6 months, and AR, for those tested in the second 6 months of FY 76.

Source: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and The Nature of Job Tasks, Part II: Personnel Characteristics, Volume 1: Summary and Analysis, pp. 128-131.



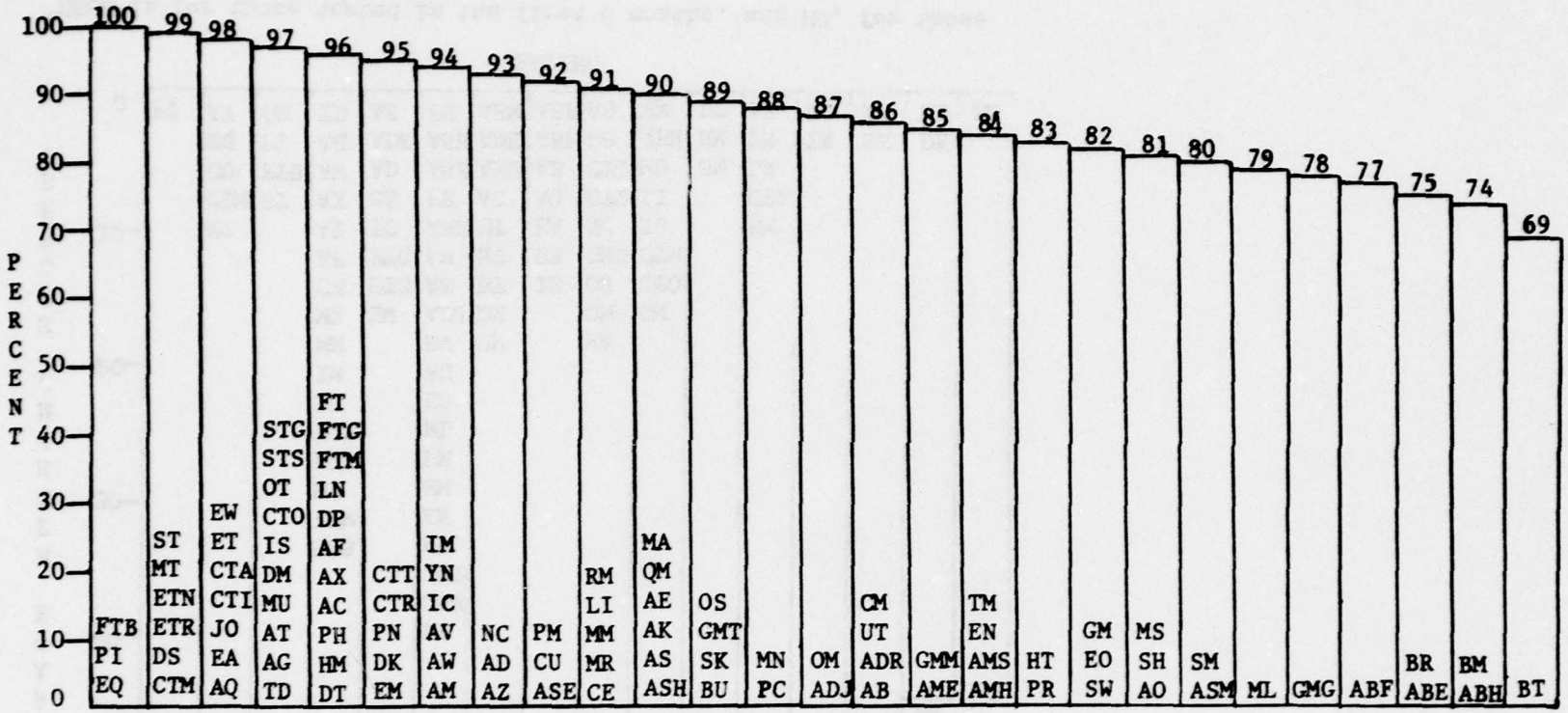
[1]MECH is for those tested in the first 6 months, and MC, for those tested in the second 6 months of FY 76.

Source: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and The Nature of Job Tasks, Part II: Personnel Characteristics, Volume 1, Summary and Analysis, pp. 133-136.

FIGURE 4

FIGURE 5

Percent of High School Graduates
Ratings: Highest to Lowest
At the End of FY 76



Source: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks, Part II: Personnel Characteristics, Volume 1: Summary and Analysis, p. 102.

age, and a decrease in ages 21-24, between 1972 and 1976 suggested a growth in the fraction of inexperienced, first-term enlistees and a reduction in experienced reenlistees. In fact, at the end of FY 76, the percentages of personnel in their first enlistment in the five occupation groups with the greatest number of technical ratings were: Deck (44%), Ordnance (51%), Aviation (55%), Electronics (57%) and Engineering & Hull (64%). Related to this is the fact that pay grades E3, E5, E6, E8, and E9 were noticeably undermanned (i.e., below 90% of requirements) at the end of FY 76, while pay grades E1 and E2 were significantly overmanned, at 159% and 244% of requirements respectively.

(2) The share of female and non-White personnel increased between 1972 and 1976, and at the end of 1976 women had begun to appear in many technical ratings previously filled only by men. Results from the aptitude tests given to new enlistees indicated that, overall, women score even higher than men on those subtests used to predict mental potential, while non-Whites have been significantly lower than Whites on these same tests. These positive findings for women and negative findings for non-Whites, combined with the increasing numbers of both groups for total Navy enlisted personnel and within technical ratings, could affect the nature of the content, organization, and presentation of technical information in the future.

D. Presentation Modes[1]

The main objective of the study on presentation modes was to prepare

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[1]Findings contained in this subsection are taken from: Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks, Part III: Presentation Modes. (See reference 7, p. 140.)

an inventory of presentation modes for presenting Technical Information to Navy enlisted technicians. The term "presentation mode" was defined in the study as the aggregate means employed to transfer technical information. Any presentation mode was envisioned being defined by its own particular: (1) medium (i.e., book, slide, video tape, etc.); (2) format (i.e., printed words, spoken words, pictures, graphics, etc.); and (3) format elements (large type, small type, spacing, color, symbols, etc.)

The search for an existing practical inventory of presentation modes, one that could be used directly in the analysis, was not productive. The inventory of "presentation modes" which ultimately was selected for detailed analysis included visual (still) format alternatives only. There were a number of important reasons for this decision. First, the possible combinations of formats and media appeared to be very large, making a test based on a representative inventory of format/medium options extremely complicated. Second, the major objective of this project -- to construct a process for selecting appropriate presentation modes according to differences in personnel and job tasks -- appeared to lend itself more to examining different formats than to examining different media. That is, the literature on presentation modes and professional judgment suggested that any differences in comprehension of job task information by a technician was probably more a function of variation in format than variations in medium.[1] Last, use of a manageable list of existing format options, which would be familiar to the test subjects, seemed better for the purposes of

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[1]Most studies on information transfer examine comprehension in terms of elements making up the communication (e.g., the visual and verbal modality of the format) rather than the means (the medium) used to transfer the communication.

this investigation than a list, including format options which are possible, but which have not been generally used in the Fleet.

The search for different kinds of visual (still) formats involved two courses of action. The first involved an examination of the literature on presentation modes. While the literature proved to be very helpful in providing insight into the concepts and systems pertaining to information transfer, no inventory of formats was found which appeared to be entirely useful. Most delivery systems (e.g., Bretz, 1971, reference 2, p. 140) and classification systems (e.g., Cavert, 1972, reference 3, p. 140)examined were too heuristic and/or detailed to be employed in their entirety in the analysis. Nevertheless, the literature was extremely important in providing ideas which formed a conceptual blueprint for constructing the inventory. The abstract-to-concrete continuum of formats suggested by the work of Dale (1969, reference 4, p. 140) and Stewart (1969, reference 8, p. 140), for example, provided a theoretical basis for classifying types of formats used to present technical information.

The second course of action undertaken in the search for different kinds of visual (still) formats was to analyze the formats of existing technical publications. Some 63 publications, dealing with a variety of electrical, electronic, hydraulic, and mechanical equipments, were examined. Additionally, interviews were conducted with personnel at the Gunnery, Fire Control Technician, and Propulsion Engineer Schools at Great Lakes Naval Training Center in an effort to identify the greatest conceivable range of visual (still) format options for presenting technical information. A tentative inventory of formats was constructed as follows:

Tentative Inventory of Presentation Format Categories[1]

(Concrete to Abstract)

Concrete

- Photograph
- Drawing
- Diagram
- Graph
- Table
- Matrix
- Text

Abstract

While the formats listed above were often used in combination in the manuals examined, each consistently appeared as a unique visual format option. The format descriptions follow:

1. Photograph: A picture of an actual piece of equipment or hardware, or of a component part.

2. Drawing: A sketch of the equipment, hardware, or a component part. The drawing can be two-dimensional or three-dimensional; it can show cutaway (cut in half), assembled, or disassembled (exploded) representations.

3. Diagram: A conceptual representation of the flows, connections, and functions of the electrical, electronic, hydraulic, or mechanical processes of equipment or hardware.

4. Graph: A conceptual representation of the relationship between two or more technical variables.

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[1]The arrangement from concrete to abstract is somewhat arbitrary. It would be difficult to prove, for example, that graphs, tables, and matrices vary substantially on indices of concreteness. However, the overall progression from photographs to texts appeared to be a reasonable continuum.

5. Table: Technical data and procedures organized by column and row headings.

6. Matrix: A special table which emphasizes the data contained in each cell formed by the intersection of a column and row.

7. Text: Printed words, sentences, and paragraphs. Text can be organized by headings and segments, or it can be free of any such visual organizers.

These visual formats appeared to represent the principal ways technical data are presented. The range of format options and combinations, from photographs to text, seemed to represent reasonable concrete-to-abstract alternatives for information presentation. The effectiveness of each format or combination of formats in presenting technical information in a comprehensible manner is considered to be related to differences in the kinds of job task information and job task performers.

E. Tentative Hypotheses Relating Presentation Modes to Classifications of Job Task Information and Personnel Characteristics

A schematic illustrating the selection of presentation modes according to personnel characteristics and classifications of job task information was given in Figure 1.

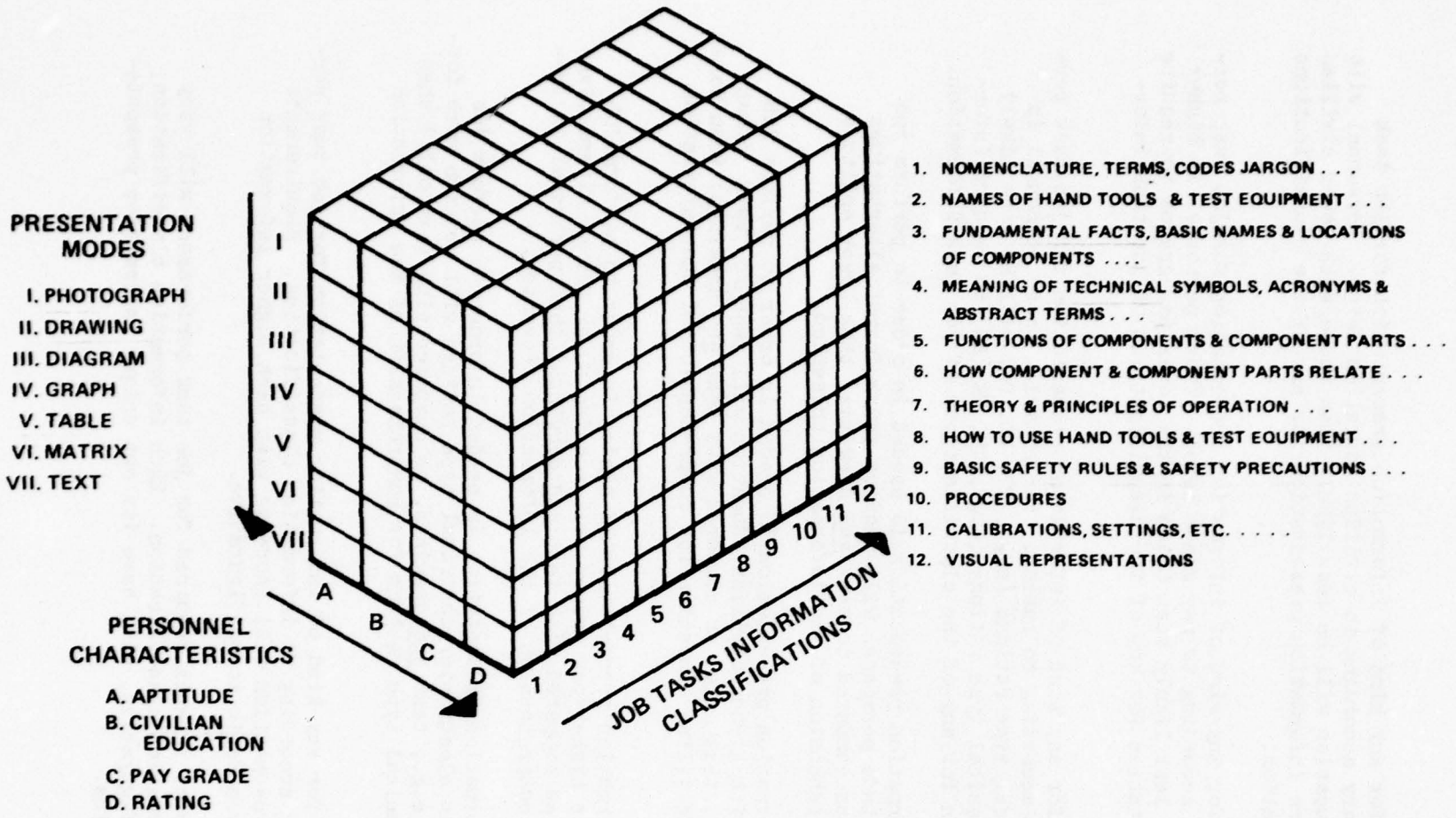
Many different factors will play a part in determining whether a particular presentation mode is appropriate for transmitting required technical information. It would be difficult to identify every kind of factor involved, and to assess its importance, in selecting effective presentation modes. However, it appeared that the sub-components of each component, as identified in the research conducted, were the main factors to be con-

sidered. Therefore, these component parts were considered to represent the population of interest (See Figure 6) for selecting presentation modes according to personnel characteristics and classifications of job task information.

A few relationships among the three principal components (presentation modes, classifications of job task information, and personnel characteristics) were suggested by the findings from the reports cited in this section. It seemed reasonable to expect that: (1) the greater a person's aptitude scores, education, and seniority, the lesser would be his need for a large number and variety of formats for presenting Technical Information; (2) personnel who performed an unusual number of job tasks on complex circuitry (i.e., personnel in electronic/electrical ratings) would have a greater need than other personnel for a large number and variety of formats for presenting Technical Information, and (3) the number and kinds of formats needed would vary according to the type of Technical Information to be presented.

A number of hypothetical statements were thus developed from the above observations which postulate relationships among the components. These hypotheses were conceived to be reasonable general predictions of how personnel characteristics and job task information can influence the selection of presentation modes, and once verified these hypothetical statements will become the framework of an analytical instrument for deciding upon appropriate presentation modes for transmitting technical information. The hypothetical statements are as follows:

1. The need for any kind of information presentation for job task performance will vary according to aptitude. Personnel with higher aptitude scores will be less likely than those with lower aptitude scores to require information presentation for any of the classifications of job task information.



*A LEVEL OF MATCH OR MISMATCH CAN BE ASSOCIATED WITH EACH CUBICAL CELL. LEVEL OF MATCH IS ULTIMATELY MEASURED IN TERMS OF A TECHNICIAN'S COMPREHENSION OF JOB TASK INFORMATION.

FIGURE 6
SCHEMATIC INDICATING MATCHING OF PRESENTATION MODES TO PERSONNEL CHARACTERISTICS AND CLASSIFICATIONS OF JOB TASK INFORMATION*

2. The need for any kind of information presentation for job task performance will vary according to civilian education level. Personnel with higher civilian education will be less likely than those with lower civilian education to require information presentation for any of the classifications of job task information.

3. The need for any kind of information presentation for job task performance will vary according to pay grade level. Those personnel in higher pay grades will be less likely than those in the lower pay grades to require information presentation for any of the classifications of job task information.

4. The need for any kind of information presentation for job task performance will vary according to rating. For example, those personnel in electronic/electrical type ratings (e.g., FT, ET, DS) will be more likely than those in mechanical type ratings (e.g., CM, MM, EN) to require information presentation for any of the classifications of job task information.

5. When information presentation IS needed in order to perform job tasks, higher aptitude personnel will require fewer format alternatives (e.g., text only, as compared to test and drawings) than lower aptitude personnel for comprehension of the information presented.

6. When information presentation IS needed in order to perform job tasks, personnel with higher civilian education will require fewer format alternatives (e.g., text only, as compared with text and drawings) than personnel with lower civilian education for comprehension of the information presented.

7. When information presentation IS needed in order to perform job tasks, personnel in higher pay grades will require fewer format alternatives (e.g., text only, as compared with text and drawings) than personnel in lower pay grades for comprehension of the information presented.

8. When information presentation IS needed in order to perform job tasks, personnel in electronic/electrical type ratings will require more format alternatives (e.g., text and drawings, as compared with text only) than personnel in mechanical type ratings for comprehension of the information presented.

9. The need for any kind of information presentation for job task performance will vary according to information classification. Requirements for information presentation will increase with each higher information classification, from Basic to Configurative.

10. The kinds of formats required for job task performance will vary according to information classification. Each information classification, from Basic to Configurative, will have its own unique information presentation characteristics.

11. The kinds of formats required for information presentation for job task performance will vary according to aptitude. Higher aptitude personnel will be less likely than lower aptitude personnel to depend upon "concrete" formats (e.g., photographs), as opposed to "abstract" formats (e.g., text), for comprehension of technical information.

12. The kinds of formats required for information presentation for job task performance will vary according to civilian education level. Personnel with higher education will be less likely than those with lower education to depend upon "concrete" formats (e.g., photographs, as opposed to "abstract" formats (e.g., text), for comprehension of technical information.

13. The kinds of formats required for information presentation for job task performance will vary according to pay grade level. Personnel in higher pay grades will be less likely than those in lower pay grades to depend upon "concrete" formats (e.g., photographs), as opposed to "abstract" formats (e.g., text), for comprehension of technical information.

III. FIELD WORK PERFORMED IN CONNECTION WITH VALIDATION OF HYPOTHESES

A. Background

A survey was conducted at selected Navy sites with a large number of personnel in certain technical ratings to assess the validity of the hypotheses described in Section II. The objective of the survey was to determine if preferences for particular formats varied with differences among technical personnel and classifications of job task information. The survey results were examined for their consistency with the hypotheses. Although it was recognized in advance that such a survey would focus on preference for, rather than comprehension of, formats, it seemed reasonable to expect that preferences would at least provide indicative evidence concerning the validity of the hypothetical statements. This approach does not deny the essential requirement for ultimately testing the hypotheses through extensive research on variations in format comprehensibility according to differences in format construction, job task categories, and Navy personnel characteristics.

B. Approach

In conducting the survey of format preferences, a distinction was made between a format category and a format type. A format category was defined as a broad classification which subsumed two or more format types. For example, a drawing (a format category) is a classification which includes format types such as an airbrushed drawing and a sketch. Seven

format categories from Part III[1] of this research project and 37 format types developed by the Anacapa Sciences, Inc. and Hughes Aircraft Comany[2] as examples of what they called "presentation components" were used in the survey. The categories (A to G) and types (1-37) were as follows:

A. PHOTOGRAPH

1. photograph
2. airbrushed photograph

B. DRAWING

3. airbrushed drawing
4. sketch
5. engineering drawing
6. two-dimensional view drawing
7. three-dimensional view drawing
8. assembled view drawing
9. disassembled (exploded) view drawing
10. cut-away view drawing

C. DIAGRAM

11. overall block diagram
12. detailed block diagram
13. schematic diagram
14. wiring diagram
15. cabling diagram
16. functional signal flow diagram
17. digital logic diagram
18. blocked schematic diagram
19. blocked digital logic diagram

C. DIAGRAM (cont'd)

20. pictorial block diagram
21. timing diagram
22. maintenance dependency chart
23. decision tree

D. GRAPH

24. waveform
25. graph

E. TEXT

26. directive text
27. deductive text
28. continuous text
29. segmented text

F. TABLE

30. retrieval-oriented list
31. glossary/abbreviations
32. materials list
33. wire list
34. procedures table
35. specialized data table

G. MATRIX

36. specialized data matrix
37. retrieval-oriented matrix

(These format types are described in detail in Appendices D and E)

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[1]Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks, Part III: Presentation Modes. (See reference 7, p. 140.)

[2]Anacapa Sciences, Inc., User-Data Match. Final Report. Concept, Development, and Description of the Model. Santa Barbara, California, May 1977. (See reference 1, p. 140.)

Hughes Aircraft Company, Ground Systems Group, Task 3 Report [CDRL A003] Preliminary NTIP System Concept and Alternative Configurations. Addendum - Concept of the User-Data Match Model. Fullerton, California, 28 January 1978. (See reference 5, p. 140.)

A questionnaire was initially planned which would have required a respondent to indicate the format categories and format types needed for the most effective presentation of technical information for each of the six broad information classifications described in Section II B of this report. However, as mentioned in Section II B, as a result of the pre-test of the questionnaire, the original six information classifications were reported as being too broad and were subsequently expanded to twelve. The 12 information classifications are contained in Section II B and Appendix B of this report.

The final questionnaire contained:

(1) instructions on how to complete the questionnaire;

(2) a sheet requesting information about the respondent's rating, pay grade, age, sex, years of Navy service, and civilian education;

(3) the 12 information classifications (as shown in Appendix B);

(4) a list of the seven format categories and the related 37 format types, and

(5) a definition and an example of each of the 37 format types.[1]

In the questionnaire, the 12 information classifications were listed in random order.

Those who participated in the survey were asked to select the kinds of formats which they considered would be most effective in clearly presenting technical information to them. Each subject was instructed to specify what he needed for effective information presentation, and NOT for what he thought others might need. Subjects were further instructed that in

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[1] These were obtained from the presentation components portrayed in both the previously cited Hughes Aircraft Company and Anacapa Sciences reports. (See references 1 and 5, p. 140.)

indicating information requirements for each classification they need not rely entirely on the seven categories and 37 types given to them as examples. However, only three subjects departed from the format examples provided. A copy of the questionnaire is included as Appendix F.

Nine Navy commands cooperated with the survey effort:

1. Combat Systems Technical Schools Command
   Vallejo, California

2. Fleet ASW Training Center Pacific
   San Diego, California

3. Fleet Training Center
   Norfolk, Virginia

4. Naval Air Station, North Island
   San Diego, California

5. Naval Air Technical Training Command
   Millington, Tennessee

6. Naval Construction Training Center
   Port Hueneme, California

7. Navy Torpedo Station
   Keyport, Washington

8. Service School Command
   Great Lakes, Illinois

9. Service School Command
   San Diego, California

These commands furnished subjects in one or more of fifteen technical ratings. Each subject was in pay grade E4, E5, E6, or E7, and each had had technical experience with the Fleet within the past two years. Although 237 subjects were surveyed, 18 questionnaires containing ambiguous or improperly completed responses were eliminated. The distribution of the remaining 219 technicians is shown by ratings and pay grades in Table 1.

TABLE 1

NUMBER OF RESPONDENTS BY RATINGS AND PAY GRADES

Rating	Total	Pay Grade E7	E6	E5	E4
Sonar Technician (ST)	15	4	4	4	3
Gunner's Mate (GM)	16	4	6	4	2
Fire Control Technician (FT)	16	2	12	2	-
Torpedoman's Mate (TM)	10	1	-	2	7
Data System's Technician (DS)	8	2	2	3	1
Electronic Technician (ET)	16	-	2	6	8
Construction Mechanic (CM)	9	1	3	3	2
Boiler Technician (BT)	15	4	8	3	-
Machinist's Mate (MM)	15	7	5	1	2
Electrician's Mate (EM)	15	5	3	6	1
Interior Communication Electrician (IC)	17	2	10	3	2
Aviation Structural Mechanic (AM)	14	3	5	6	-
Aviation Ordnance Man (AO)	16	6	6	3	1
Aviation Electrician's Mate (AE)	19	5	4	6	4
Aviation Electronics Technician (AT)	18	3	4	8	3
Total	219	49	74	60	36

C. Findings

The responses to the questionnaires were analyzed for patterns in format preferences for each information classification. This was done for:

(1) total subjects

(2) subjects differentiated by ratings

(3) subjects differentiated by pay grades

(4) subjects differentiated by GCT scores

(5) subjects differentiated by civilian education

The results of format selections for the twelve information classifications are reported by format categories and format types for total subjects summed over all ratings, and for subjects in each rating. The findings for subjects differentiated by pay grade, GCT, and civilian education are based on samples specially selected from the total subject population, and the analysis in these three instances had to be confined to format categories alone, because the total number of selections of individual format types were too small to permit meaningful analysis.

Total Subjects

The preference for some sort of information presentation varied directly with the order of difficulty originally conceived for the list (Section III B) of information classifications (IC). Table 2 shows, for example, that 83 subjects expressed no requirement for information of the IC-1 classification (nomenclature, terms, codes, and jargon), as compared to only one subject for the IC-10 classification (procedures, etc.) Thus, except for the IC-8 classification (How to use hand tools and testing equipment), the number of subjects expressing no need for information generally was

TABLE 2

NUMBER OF SUBJECTS WHO SELECTED A FORMAT CATEGORY
FOR EACH INFORMATION CLASSIFICATION

	FORMAT CATEGORIES								
Information Classification[a]	None[b]	Photo	Drawing	Diagram	Graph	Text	Table	Matrix	Total[c]
1	83	8	19	10	1	28	113	2	181
2	66	33	31	20	3	52	109	2	250
3	30	41	110	67	1	99	59	7	384
4	26	6	18	7	3	45	176	2	257
5	23	22	65	94	12	147	42	9	391
6	14	14	68	134	7	116	33	1	373
7	7	60	118	125	23	172	63	9	556
8	78	23	40	26	5	104	65	-	263
9	18	27	32	17	1	173	39	-	289
10	1	43	165	125	33	162	109	11	648
11	9	16	43	40	16	75	170	5	365
12	9	30	101	180	9	114	50	7	491
Total		323	810	845	114	1,273	1,028	55	

[a]See Appendix B for definitions of information classifications.

[b]Total number of subjects indicating no information requirement.

[c]Excludes "none" column. Subjects could and often did pick more than one Format Category for a given Information Classification. For example, from 136 subjects (219-83) who indicated a requirement for some kind of information in IC-1, 113 expressed a need for the Table format. The 28 who indicated a need for the Text format were totally or partially included in the 113.

much greater for the lower-numbered (simplest) information classifications than for the higher-numbered (more complex) classifications. This finding supports one of the hypothetical statements in Section II, as well as the conclusion in Part I of this research, that the tendency for personnel to rely on information presentation in technical job task performance would increase by successive levels of difficulty of information classification (i.e., from Basic, to Conjoint, to Operational, to Procedural, to Multifactual, to Configurative).[1]

Table 2 shows further that the total number of format selections varied significantly from a low of 181 for IC-1 to a high of 648 for IC-10, showing the general trend referred to above; i.e., that the subjects expressed a greater requirement for the higher-numbered information classifications. These figures suggest that:

(1) IC-7, IC-10, and IC-12. The test subjects consider that, for theory and principles of operation, procedures, and visual representations of the operational processes of complex circuitry, the greatest number of formats for presenting technical information are required. That is, in these IC's a multi-format presentation is needed.

(2) IC-3, IC-5, IC-6, and IC-11. Test subjects consider that, for fundamental facts, names, locations, etc.; the functions of components and component parts; how components and component parts relate to an entire system; and calibrations, settings, etc., the next greatest number of formats are needed.

(3) IC-1, IC-2, IC-4, IC-8, and IC-9. Test subjects consider that, for nomenclature, terms, codes, jargon; names of hand tools and testing equipment; how to use hand tools and testing equipment; and basic safety rules or special safety precautions, technical information may be presented in fewer formats. That is, there is greater unanimity as to formats required for these IC's.

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[1] Thomas E. Powers, Selecting Presentation Modes According to Personnel Characteristics and the Nature of Job Tasks, Part I Job Tasks, pp. IV-1 to IV-15. (See reference 7, p. 104.)

Table 3, compiled from Table 2, shows the format categories that were most frequently selected by the test subjects with respect to each information classification. There is much variation by information classification in the kind and number of formats that the subjects considered necessary for the effective presentation of technical information. For example, while a table format was the only format to be selected by at least a majority of the subjects for the effective presentation of IC-1 information, majority preferences for IC-10 information included drawing, diagrams, text, and table formats. Table 3 shows that across information classifications, a consistently higher percentage of all subjects selected the more abstract formats (text and table) than the more concrete formats (photograph, drawing and diagram). The percentage of subjects selecting a graph or matrix format was negligible in virtually every information classification.

Table 4 shows the total number of format-type selections within each format category, summed over the total subject population. The table is of interest in highlighting which format types were most preferred for each information classification and how the type of format preferred varied as a function of information classification. Thus, a strong preference was declared for a Table format category for IC-1 and IC-2 (see Tables 2 and 3). Table 4 shows that a Glossary format type of table (31) was most frequently indicated for IC-1, and a Materials List format type of table (32) for IC-2. Appendix E contains the names and definitions of the 37 format types.

A number of interesting findings are derived from Table 4 as follows:

(1) Only in four instances was any format type selected by 50% or more of the subjects. These were: (a) Glossary (No. 31) for IC-4; (b) Deductive Text (No. 26) for IC-9; (c) Deductive Text (No. 26) for IC-10;

TABLE 3

FORMATS SELECTED MOST OFTEN BY INFORMATION CLASSIFICATIONS
(All Subjects)

Information Classification[a]	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
1						H	
2					M	H	
3		H	M		M	M	
4					M	H	
5		M	M		H		
6		M	H		H		
7	M	H	H		H	M	
8					M	M	
9					H		
10	M	H	H		H	H	
11		M			M	H	
12		M	H		H	M	

[a]See Appendix B for definitions of Information Classifications.

H = High: at least 50% of the 219 subjects selected the format category.

M = Medium: from 20% to 49% of the 219 subjects selected the format category.

TABLE 4

NUMBERS[b] OF SUBJECTS WHO SELECTED EACH FORMAT TYPE
FOR EACH INFORMATION CLASSIFICATION

Format Category:	Photo		Drawing								Diagram												
Format Type:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Information Classification[a]																							
1	8		3	5	1	7	3	3	6	4	4	3	3	1	1	1				1			
2	33	1	5	12	6	12	6	5	3	1	6	3	5	2	1	1	1	1	1	5	1	9	3
3	37	6	15	19	9	25	47	37	48	27	22	14	11	10	12	7	4	11		21			1
4	5	1	1	13	2	4	2	2	4	2	2	3	2	1	1	1	1	2	1	1	1	2	1
5	21	3	4	16	6	11	15	12	26	30	23	29	38	11	4	24	13	22	13	14	11	7	6
6	11	3	7	8	5	8	22	21	37	19	60	35	23	15	19	33	7	22	11	43	8	10	8
7	54	8	10	36	12	40	24	26	42	31	63	46	61	23	14	47	12	23	9	21	23	7	11
8	21	2	3	13	1	21	3	5	8	1	4	1	4		2	2		2	1	4	3	11	4
9	24	3	10	12		4	6	1	3	4	3	1	4	5	1	2				2		3	1
10	39	5	11	13	18	27	36	68	142	46	30	39	66	53	26	49	19	28	15	16	24	36	32
11	13	4	5	7	7	9	6	12	10	15	3	5	6	5	2	6	1	3		6	9	14	5
12	23	9	5	12	15	22	32	37	56	48	48	52	104	77	47	60	13	31	16	26	9	5	6

[a]See Appendix B for definitions of information classifications. See Appendices D and E for definitions of Format Types.

[b]Each subject may of course have selected more than one format type. Thus, of the 113 subjects in Table 2 who indicated a need for the Table Format category for IC-1, 99 subjects required Format Type no. 31, and 20 subjects required Format Type no. 30. The latter 20 subjects were totally or partially included among the former 99 subjects.

NUMBERS[b] OF SUBJECTS WHO SELECTED EACH FORMAT TYPE
FOR EACH INFORMATION CLASSIFICATION

Format Category:	FORMATS													
	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Information Classification[a]														
1		2	5	3	9	15	20	99	13	6	3	4	1	1
2	2	1	30	8	8	11	8	25	77		20	15	1	1
3		1	23	9	39	43	16	35	18	3	3	11	1	6
4	2	3	7	6	16	28	24	160	9	1	6	12	2	
5	9	7	32	24	77	46	15	18	7	3	13	7	6	5
6	4	4	24	12	61	40	10	12	11	3	8	6	1	
7	17	11	43	26	103	55	18	23	14	3	24	15	3	8
8	4	4	72	15	28	18	7	7	19	1	49	4		
9		1	143	18	20	22	6	14			23	7		
10	32	6	120	32	25	40	15	20	40	16	79	19	6	8
11	12	9	50	11	17	24	14	21	14	1	80	101	1	4
12	8	3	38	20	47	45	11	14	16	22	13	11	6	4

[a]See Appendix B for definitions of information classifications. See Appendices D and E for definitions of Format Types.

[b]Each subject may of course have selected more than one format type. Thus, of the 113 subjects in Table 2 who indicated a need for the Table Format category for IC-1, 99 subjects required Format Type no. 31, and 20 subjects required Format Type no. 30. The latter 20 subjects were totally or partially included among the former 99 subjects.

TABLE 4 (cont'd)

and (d) Exploded View drawing (No. 9) for IC-10. In fact, of the 444 cells which compose the 12 x 37 matrix of Table 4, only 42 cells contain a number of subjects which are 20% or more of the total. This finding emphasizes the wide diversity among subjects with respect to preferences at the format-type level.

(2) Those format types selected by at least 20% of the subjects were:

(a) IC-1: Glossary Table

(b) IC-2: Materials List Table

(c) IC-3: Three-Dimensional View Drawing; Exploded View Drawing

(d) IC-4: Glossary Table

(e) IC-5: Continuous Text; Segmented Text

(f) IC-6: Overall Block Diagram; Pictorial Block Diagram; Continuous Text

(g) IC-7: Photograph; Overall Block Diagram; Detailed Block Diagram; Schematic Diagram; Functional Signal Flow Diagram; Directive Text; Continuous Text; Segemented Text

(h) IC-8: Directive Text; Procedures Table

(i) IC-9: Directive Text

(j) IC-10: Assembled View Drawing; Exploded View Drawing; Cut-Away View Drawing; Schematic Diagram; Wiring Diagram; Functional Signal Flow Diagram; Directive Text; Procedures Table

(k) IC-11: Directive Text; Procedures Table; Specialized Data Table

(l) IC-12: Exploded View Drawing; Cut-Away View Drawing; Overall Block Diagram; Detailed Block Diagram; Schematic Diagram; Wiring Diagram; Cabling Diagram; Functional Signal Flow Diagram; Digital Logic Diagram; Continuous Text; Segmented Text

(3) Of the 37 format types, 19 were selected by at least 20% or more of the respondents in one or more of the information classifications. The names of these format types and the information classifications in which

they were prominent follow:

(a) Photograph: IC-7

(b) Three-Dimensional View Drawing: IC-3

(c) Assembled View Drawing: IC-10

(d) Exploded View Drawing: IC-3, IC-10, IC-12

(e) Cut-Away View Drawing: IC-10, IC-12

(f) Overall Block Diagram: IC-6, IC-7, IC-12

(g) Detailed Block Diagram: IC-7, IC-12

(h) Schematic Diagram: IC-7, IC-10, IC-12

(i) Wiring Diagram: IC-10, IC-12

(j) Cabling Diagram: IC-12

(k) Functional Signal Flow Diagram: IC-7, IC-10, IC-12

(l) Pictorial Block Diagram: IC-6

(m) Directive Text: IC-7, IC-8, IC-9, IC-10, IC-11

(n) Continuous Text: IC-5, IC-6, IC-7, IC-12

(o) Segmented Text: IC-5, IC-7, IC-12

(p) Glossary Table: IC-1, IC-4

(q) Materials List Table: IC-2

(r) Procedures Table: IC-8, IC-10, IC-11

(s) Specialized Data Table: IC-11

Ratings

Because the main distinctions observed are related to individual technical information classifications rather than to technical information as a whole, in the pages that follow, each information classification in itself is examined for similarities and differences among format categories and format types by ratings.

One distinction among the ratings occurred so consistently throughout the twelve information classifications, however, that it is possible to report it as a general finding. Those ratings most closely identified with the electrical/electronic occupational specialties (i.e., primarily FT's, DS's, ET's, EM's, IC's, AE's, and AT's) were inclined to identify the need for a greater quantity of formats than other ratings surveyed. Most mechanical ratings (e.g., MM's, AM's) seemed to require significantly less diversified technical data presentation than the other ratings mentioned above.

A summary of the main findings with respect to ratings for each information classification follows. For each discussion of an information classification, two related tables are provided. One contains the number of preferences by ratings for each format category, and the other, the same information for each format type.

(1) IC-1: Nomenclature, Terms, Codes, Jargon (Tables 5 and 6)

Format Categories: There was a high selection of the Table format across all ratings, and consistently low selection of other formats. Preference for concrete formats (Photos, Drawings, Diagrams), though low overall, was more in evidence among some Engineering & Hull (EM, IC) and Aviation (AE, AT) ratings than other ratings.

Format Types: Preference for a Glossary type of Table (No. 31) was consistently high for most ratings. Counts for other format types were insignificant.

(2) IC-2: Names of Hand Tools and Testing Equipment (Tables 7 and 8)

Format Categories: Although a high level of selection of the Table format occurred across ratings, some ratings (GM, ET, AE) also indicated

TABLE 5

Technical Information Classification: Nomenclature, terms, codes, and jargon, in one's occupational specialty. (IC-1)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	9	-	1	1	1	1	6	-
GM (16)	7	-	-	-	-	3	8	-
FT (16)	5	-	-	-	-	4	10	-
TM (10)	3	-	1	-	-	1	5	-
DS (8)	1	-	-	-	-	3	5	-
ET (16)	5	1	1	1	-	1	7	-
CM (9)	5	-	-	-	-	-	4	-
BT (15)	5	-	2	-	-	3	9	-
MM (15)	5	-	3	-	-	-	10	-
EM (15)	6	-	1	3	-	2	8	-
IC (17)	6	-	4	2	-	4	10	-
AM (14)	10	-	-	-	-	1	4	-
AO (16)	8	-	2	-	-	1	5	-
AE (19)	5	3	3	3	-	1	10	-
AT (18)	3	4	1	-	1	3	12	2
Total (219)	83	8	19	10	2	28	113	2

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 6

Technical Information Classification: Nomenclature, terms, codes, and jargon, in one's occupational specialty. (IC-1)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																						
Format Category:		Photo		Drawing								Diagram												
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)	9									1						1								
GM (16)	7																							
FT (16)	5																							
TM (10)	3			1																				
DS (8)	1																							
ET (16)	5	1								1		1		1										
CM (9)	5																							
BT (15)	5				1		1																	
MM (15)	5			2	1	1	1	2	1	1	2													
EM (15)	6						1					1	1	1										
IC (17)	6				1		3								1		1				1			
AM (14)	10																							
AO (16)	8							1			1													
AE (19)	5	3			1		1		1	2	1	2	2	1										
AT (18)	3	4			1				1	1														
Total (219)	83	8		3	5	1	7	3	3	6	4	4	3	3	1	1	1				1			

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed. With respect to Format Type: N = None; each number corresponds with a format type name given on the previous page.

Technical Information Classification: Nomenclature, terms, codes, and jargon, in your occupational specialty. (IC-1)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)		1		1				6						
GM (16)			1			2	1	7	1					
FT (16)						4	3	10						
TM (10)			1	1	1	1	1	5						
DS (8)					2	1		5						
ET (16)						1	2	6	1	1	1	1		
CM (9)								2	2	1				
BT (15)			1		2		1	8	1					
MM (15)							1	10	2					
EM (15)			1			1	1	6	1			1		
IC (17)					3	2	4	8	2		1	1		
AM (14)				1				3	1					
AO (16)						1	1	4		1				
AE (19)						1	2	9		2	1	1		
AT (18)		1	1		1	1	3	10	2	1			1	1
Total (219)	-	2	5	3	9	15	20	99	13	6	3	4	1	1

TABLE 6 (cont'd)

TABLE 7

Technical Information Classification: Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware. (IC-2)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	4	1	2	-	-	1	10	-
GM (16)	4	4	2	2	-	9	8	-
FT (16)	3	5	3	1	-	5	8	-
TM (10)	3	2	2	2	-	-	3	-
DS (8)	-	1	2	-	-	3	8	-
ET (16)	-	3	2	1	-	8	11	1
CM (9)	-	1	4	3	1	2	6	-
BT (15)	7	-	3	-	-	1	5	1
MM (15)	5	1	1	-	-	5	8	-
EM (15)	6	1	-	2	-	2	8	-
IC (17)	6	2	4	4	2	3	6	-
AM (14)	5	2	-	1	-	2	7	-
AO (16)	8	2	-	-	-	2	8	-
AE (19)	8	6	3	2	-	6	7	-
AT (18)	7	2	3	2	-	3	6	-
Total (219)	66	33	31	20	3	52	109	2

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware. (IC-2)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																							
Format Category:		Photo		Drawing								Diagram													
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)	4	1		1	1	2	1																	
GM (16)	4	4					1		1												2		1	
FT (16)	3	5	1	1	3	1																	1	
TM (10)	3	2		1		1	1	2				1	1	1	1	1					2			
DS (8)		1			1			1		1														
ET (16)		3		1	1		1	1															1	
CM (9)		1		1	2		1	2	1	1		2	1										1	1
BT (15)	7				1	1	1																	
MM (15)	5	1			1																			
EM (15)	6	1																					2	
IC (17)	6	2					3		1	1	1	1	1	3	1			1	1	1	1	1	1	
AM (14)	5	2																					1	
AO (16)	8	2																						
AE (19)	8	6				1	2					1		1			1						1	1
AT (18)	7	2			2		1		2			1												1
Total (219)	66	33	1	5	12	6	12	6	5	3	1	6	3	5	2	1	1	1	1	1	5	1	9	3

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 8

TABLE 8 (cont'd)

Technical Information Classification: Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware. (IC-2)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)			1		1		1	1	9					
GM (16)			7		1	1		2	6		2			
FT (16)			3	2	1		1	3	6			2		
TM (10)							1	3						
DS (8)				1	1	1			7		1	2		
ET (16)			5	1	2	1	1	3	7		3	3	1	
CM (9)		1	2	1	1		1	2	2		3	2		
BT (15)			1					1	3			2		1
MM (15)			3	1		1	1	1	8		1			
EM (15)			2					1	7		2	1		
IC (17)	2		2			1		1	3		2	1		
AM (14)			1			1			6		1			
AO (16)					1	1	1	1	6		3			
AE (19)			2	2		2	1	5	3		1	1		
AT (18)			1			2		1	4		1	1		
Total (219)	2	1	30	8	8	11	8	25	77	-	20	15	1	1

TABLE 9

Technical Information Classification: Fundamental facts, basic names, and locations of components and component parts of equipment/hardware. (IC-3)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	2	5	7	-	8	3	2
GM (16)	2	3	6	4	-	10	3	-
FT (16)	3	4	8	4	-	8	3	-
TM (10)	2	2	7	1	-	2	2	-
DS (8)	-	1	7	3	-	6	2	1
ET (16)	1	8	11	4	-	9	7	3
CM (9)	2	2	5	2	-	2	5	-
BT (15)	2	1	10	2	1	10	3	1
MM (15)	3	2	6	5	-	7	6	-
EM (15)	1	2	5	7	-	6	3	-
IC (17)	2	2	7	7	-	10	4	-
AM (14)	6	2	5	2	-	1	1	-
AO (16)	5	1	5	3	-	4	3	-
AE (19)	1	6	9	8	-	10	7	-
AT (18)	-	3	14	8	-	6	7	-
Total (219)	30	41	110	67	1	99	59	7

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 10

Technical Information Classification: Fundamental facts, basic names, and locations of components and component parts of equipment/hardware. (IC-3)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																						
Format Category:		Photo		Drawing								Diagram												
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)		2					2	1	2	3	2	1	3	2		2			1		2			
GM (16)	2	3					1	3	2	1				1					1		2			
FT (16)	3	3	1	5	2	1	4	5	3	4	3	2				2					1			
TM (10)	2	1	1	2	3		1	1	3	2											1			
DS (8)		1		2	2	2	4	2	2	4	1	1	1				1	2			1			
ET (16)	1	6	3	2	2	3	3	5	6	8	6	1	1	1	2	2	1				1			
CM (9)	2	2					2	4	4	1	2	1					1				1			
BT (15)	2	1		1	1			3	2	4	3	1									2			
MM (15)	3	2	1	1	1	1	1	4	1	3	2	1		1		1	2		2					
EM (15)	1	2		1	1		1	2	1	2	1	4	1	2	1	2			2					
IC (17)	2	2			1		1	3		3	1		1		2	2			3		3			
AM (14)	6	2			2			1	1	1									1		1			
AO (16)	5	1			1	1	2	3	2	2	1	2	1											
AE (19)	1	6		1			1	5	2	5	2	3	3	2	3	1		1			3			
AT (18)		3			3	1	2	5	6	5	3	5	3	2	2		2	1	1		3			1
Total (219)	30	37	6	15	19	9	25	47	37	48	27	22	14	11	10	12	7	4	11		21			1

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: Fundamental facts, basic names, and locations of components and component parts of equipment/hardware. (IC-3)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)			1		5	2	3	1						2
GM (16)			3		2	5		1	2			1		
FT (16)					5	4	2	3				1		
TM (10)			1	1	1		1	2						
DS (8)			1	2	4			1	1				1	
ET (16)			5	3	3	6	4	3	3	1		3		3
CM (9)			2	1			1	4	2	1	1	1		
BT (15)		1	1	1	4	4	1	2	2					1
MM (15)			2		4	1	1	3			1	1		
EM (15)			1		2	3	1	1	2					
IC (17)			1	1	6	3		1	2		1	1		
AM (14)						1						1		
AO (16)			1			3		3	1					
AE (19)			1		2	9	2	4	2			1		
AT (18)			3		1	2		6	1	1		1		
Total (219)	-	1	23	9	39	43	16	35	18	3	3	11	1	6

TABLE 10 (cont'd)

TABLE 11

Technical Information Classification: The meaning of technical symbols, acronyms and abstract terms. (IC-4)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	-	-	-	-	3	14	-
GM (16)	2	-	3	-	-	7	14	-
FT (16)	1	1	3	2	-	5	13	-
TM (10)	5	-	-	-	-	1	5	-
DS (8)	-	-	-	-	-	2	7	-
ET (16)	-	-	1	-	-	7	12	-
CM (9)	1	-	2	-	-	3	5	-
BT (15)	1	1	3	-	-	1	14	1
MM (15)	2	1	1	-	-	1	13	1
EM (15)	1	-	-	1	-	1	13	-
IC (17)	2	-	1	2	1	5	14	-
AM (14)	5	-	1	-	-	1	9	-
AO (16)	-	-	1	1	-	2	15	-
AE (19)	6	2	1	-	1	2	12	-
AT (18)	-	1	1	1	1	4	16	-
Total (219)	26	6	18	7	3	45	176	2

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: The meaning of technical symbols, acronyms and abstract terms. (IC-4)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																						
Format Category:		Photo		Drawing								Diagram												
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)																								
GM (16)	2				2	1	1																	
FT (16)	1	1		1	2	1	3	2	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
TM (10)	5																							
DS (8)																								
ET (16)					1																			
CM (9)	1				1				1															
BT (15)	1	1			3																			
MM (15)	2	1			1																			
EM (15)	1																		1					
IC (17)	2									1			1										1	
AM (14)	5				1																			
AO (16)					1									1										
AE (19)	6	1	1							1														
AT (18)		1			1								1											
Total (219)	26	5	1	1	13	2	4	2	2	4	2	2	3	2	1	1	1	1	2	1	1	1	2	1

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 12

TABLE 12 (cont'd)

Technical Information Classification: The meaning of technical symbols, acronyms and abstract terms. (IC-4)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)					2	1	4	13						
GM (16)			1			6	1	9				4		
FT (16)					4	3	4	12						
TM (10)			1	1	1	1	1	5						
DS (8)				1	1		1	7						
ET (16)					3	7	3	12				1		
CM (9)			3	1			1	5	1		1			
BT (15)				1		1	2	13	1			2	1	
MM (15)					1		2	11				2	1	
EM (15)						1		13	1					
IC (17)	1	1			2	4	1	13	1		2			
AM (14)						1		8				1		
AO (16)					1	1	2	14						
AE (19)	1	1		1		1		11	1		1	1		
AT (18)		1	2	1	1	1	2	14	4	1	2	1		
Total (219)	2	3	7	6	16	28	24	160	9	1	6	12	2	-

relatively high preferences for the Text format.

Format Types: Preference for a Materials List Type of Table (No. 32) was consistently high for most ratings. Personnel in the CM, BT, IC, and AE ratings were relatively lower than other ratings in selecting a Materials List, but only in the case of AE's was there a stronger preference (Photograph and Glossary) expressed.

(3) IC-3: Fundamental Facts, Basic Names, and Locations of Components and Component Parts (Tables 9 and 10)

Format Categories: Drawing and Text were consistently high for most ratings. Ratings in which 50% or more of the subjects expressed a preference for drawings were FT, TM, DS, ET, CM, BT, and AT; for Text, ST, GM, FT, DS, ET, BT, IC, and AE. Slightly less than a majority of the ST's, DS's, EM's, IC's, AE's, and AT's chose diagrams. A majority of CM's selected Table; while ET's, MM's, AT's were just under a majority. Only in the case of the Photo format (for ET's only) did 50% or more in a rating select any other format.

Format Types: There were virtually no clear patterns of preference by ratings for types of formats, even among the highest selected format categories (Drawing, Text, Diagram, Table). The only exceptions were in the DS and ET ratings, in which half of the DS's chose Two Dimensional View Drawing (No. 6), Exploded View Drawing (No. 9) and Continuous Text (No. 28); and half of the ET's, Exploded View Drawing (No. 9).

(4) IC-4: The Meaning of Technical Symbols, Acronyms, and Abstract Terms (Tables 11 and 12)

Format Categories: The great majority of subjects in virtually every rating selected the Table format. The Text format was a distant second as a choice, with the highest number of preferences coming from the GM, FT, ET, IC, and AT ratings.

TABLE 13

Technical Information Classification: The functions of components and component parts of equipment/hardware. (IC-5)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	1	1	4	8	1	13	2	-
GM (16)	1	3	7	4	-	11	3	-
FT (16)	1	1	3	11	2	13	2	-
TM (10)	5	2	2	2	-	3	1	1
DS (8)	-	1	2	5	1	7	2	1
ET (16)	-	-	2	10	2	12	7	2
CM (9)	1	1	6	4	-	4	3	-
BT (15)	1	1	4	5	1	11	4	2
MM (15)	-	2	6	5	-	12	3	-
EM (15)	-	-	4	5	1	11	1	1
IC (17)	1	2	4	7	-	14	5	-
AM (14)	5	1	5	2	-	6	1	-
AO (16)	3	1	4	6	-	10	1	1
AE (19)	4	3	7	8	2	8	6	-
AT (18)	-	3	5	12	2	12	1	1
Total (219)	23	22	65	94	12	147	42	9

Note: **The parenthetical number after each rating refers to the number of enlisted technicians interviewed.**

Technical Information Classification: The functions of components and component parts of equipment/hardware. (IC-5)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																						
Format Category:		Photo		Drawing								Diagram												
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)	1	1			1				2	3	1	1	2	3		1	2	1	2	1		1		1
GM (16)	1	3		1			1	4		1	4	1	1						1		1			
FT (16)	1	1			3		2	2		2	1	2	3	7	2		5	1	1		1	2		
TM (10)	5	1	1								2	1	1	1	1	1	1	1	1	2	1	1	1	1
DS (8)		1					1				1		2	3			2	4		2	1	3		
ET (16)				1	1	1	1	1	1	2	2	4	5	6	2	1	4	2	4	3	3	2	2	2
CM (9)	1	1			1		2	4	2	3	3	1	3	2	1	1	2	2	2	1	1	1	2	1
BT (15)	1	1			1	1			1	3	3	4		1										
MM (15)		2	1	1	2	1	1	1	1	4	2	2	1	1						1	1		1	
EM (15)					1				1	3	1			2			1		3					
IC (17)	1	2			1		1		1	1	1		3	2			2		3					
AM (14)	5	1							1	1	4			2										
AO (16)	3	1			2			1		1	1		2	1							1			
AE (19)	4	3			1	2	1	1		1	2	3	2	2	2		1		2	1	2			1
AT (18)		3	1	1	2	1	1	1	2	1	2	4	4	5	3		4	2	3	2	2	1	1	
Total (219)	23	21	3	4	16	6	11	15	12	26	30	23	29	38	11	4	24	13	22	13	14	11	7	6

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 14

TABLE 14 (cont'd)

Technical Information Classification: The functions of components and component parts of equipment/hardware. (IC-5)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)	1	1		2	9	2	2	1						
GM (16)			1	1	6	4	1	1			2			
FT (16)	1	1		1	9	5	1	2	1					
TM (10)			2	1	1	2	1	1	1	1	1	1	1	
DS (8)	1		1	3	4	1	1		1			1	1	
ET (16)	2	1	4	4	6	7	3	3	1			2	1	2
CM (9)			4	2	2	1		2			1			
BT (15)		1	3	3	5	2	1	2	1		2		1	1
MM (15)			2	1	4	6	1	2						
EM (15)	1	1	3		5	7	1				1	1	1	1
IC (17)			2	1	7	6	1	2	2	1	2	1		
AM (14)			2	1	3						1			
AO (16)			3	1	6		1							1
AE (19)	1	1	3		4	2	1	2		1	2	1		
AT (18)	2	1	2	3	6	1					1		1	
Total (219)	9	7	32	24	77	46	15	18	7	3	13	7	6	5

TABLE 15

Technical Information Classification: How components and component parts relate to the entire equipment/hardware system. (IC-6)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	1	1	10	1	9	1	-
GM (16)	-	1	9	10	-	10	1	-
FT (16)	-	1	3	15	1	12	4	-
TM (10)	2	3	4	4	-	2	2	-
DS (8)	-	-	1	6	-	5	2	-
ET (16)	-	1	3	11	1	14	5	1
CM (9)	1	1	7	5	-	4	1	-
BT (15)	-	-	7	7	1	11	2	-
MM (15)	1	-	5	8	-	8	4	-
EM (15)	1	1	10	5	1	9	2	-
IC (17)	2	1	3	13	-	8	-	-
AM (14)	3	-	5	3	-	6	2	-
AO (16)	2	-	4	8	1	6	1	-
AE (19)	2	1	4	14	1	6	3	-
AT (18)	-	3	2	15	-	6	3	-
Total (219)	14	14	68	134	7	116	33	1

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 16

Technical Information Classification: How components and component parts relate to the entire equipment/hardware system. (IC-6)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																							
Format Category:		Photo		Drawing								Diagram													
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
Rating																									
ST (15)		1					1			1		4	4	1		2	2				2	1			
GM (16)		1		1				3	4	6	2	2	1	2			3				6				
FT (16)		1		1	2	1	1	2	2	1	2	11	6	1	1	3	3	1	3	3	4	1			
TM (10)	2	2	1		1			2	2	2	1	1	1	1	1	1	1	1	1	2	2	1	2	1	
DS (8)										1	1	4	2				2	1	2	1	3	1			
ET (16)		1		1	1	2	1	1	1	2	2	5	6	3	3	3	6	3	5	2	5	3	2	2	
CM (9)	1	1		1			3	4	5	5	3	3	1	2	1	2	1	1	1	1	2	1	1	1	
BT (15)					1			2	3	2	5	2		1		1	1				4				
MM (15)	1				1		1	1	1	3		1	1	3			2		3		4				
EM (15)	1	1		1	1	1		1	1	5	1	1	1	2	2	1	1		1		1				
IC (17)	2		1	1						3	1	5	3	1		1	3		2		4		3	2	
AM (14)	3				1			2		2		1		1							1				
AO (16)	2							3		2		3	1			1	1				1			1	
AE (19)	2	1		1		1		1	1	1		7	3	2	1		2		3		2		1	1	
AT (18)		2	1				1		1	1	1	10	5	3	6	4	5		1	2	2		1		
Total (219)	14	11	3	7	8	5	8	22	21	37	19	60	35	23	15	19	33	7	22	11	43	8	10	8	

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: How components and component parts relate to the entire equipment/hardware system. (IC-6)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)	1				5	4	1							
GM (16)			2		5	3						1		
FT (16)	1			1	8	4	1	4	1			1		
TM (10)			1	1	1	2	1	2	1	1	1	1		
DS (8)			1	2	3		2							
ET (16)	1		4	3	9	6	2	1	4	1		1	1	
CM (9)			3	1	1	1		1						
BT (15)		1	1		8	3	1	1	1		1			
MM (15)			3	1	1	4	2	1	1					
EM (15)	1	1	1		5	4					2	1		
IC (17)					5	4								
AM (14)			3		3						2			
AO (16)		1	3		3				1					
AE (19)		1			2	5		1			1	1		
AT (18)			2	3	2			1	2	1	1			
Total (219)	4	4	24	12	61	40	10	12	11	3	8	6	1	-

TABLE 16 (cont'd)

Format Types: Clearly, the overwhelming choice in every rating was a Glossary type of Table (No. 31). Only in the case of GM's and ET's was there reported any other high preference format type (i.e., Segmented Text, No. 29).

(5) IC-5: The Functions of Components and Component Parts of Equipment Hardware (Tables 13 and 14)

Format Categories: Except for TM's, CM's, AM's and AE's, the great majority of the subjects in each rating selected the Text format. The Diagram format was selected by a high percentage of subjects from the ST, FT, DS, ET, CM, IC, AE, and AT ratings (most of whom belong to electrical/electronic occupational specialties), and the Drawing format received its highest selection ratio from subjects in the GM, CM, MM, AM, and AE ratings (most of whom belong to mechanical occupational specialties). Except for the Table format category in the case of ET's and AE's, no rating reported a high number of choices in any other format category.

Format Types: While Continuous Text (No. 28) was clearly the first choice of most ratings, ET's, MM's, and EM's were slightly more inclined to select Segmented Text (No. 29). Interestingly, although the Drawing and Diagram format categories were selected by relatively high percentages of total subjects (Table 13), no particular types of drawings and diagrams predominated for any rating. However, slightly less than a majority of the subjects in the FT, DS and ET ratings selected the Schematic type diagram (No. 13).

(6) IC-6: How Components and Component Parts Relate to the Entire Equipment/Hardware System (Tables 15 and 16)

Format Categories: At least 50% of ST's, GM's, FT's, DS's, ET's, CM's MM's, IC's, AO's, AE's, and AT's selected the Diagram format, while subjects

from the remaining ratings (mostly from the mechanical and pneumatic/ hydraulic occupational specialties) showed less than 50% selecting that format. In the case of the Text format, selection was made by 50% or more of the subjects in the ST, GM, FT, DS, ET, BT, MM, and EM ratings. The only other format category with a significant total number of choices was the Drawing category, almost half of which came from GM's, CM's, BT's, and EM's.

Format Types: Despite the fact that overall Block Diagram (No. 11) and Pictorial Block Diagram (No. 12) received the highest number of preferences among types of diagrams, a majority of subjects in only two ratings (FT and AT) selected the former format type, and no rating had a majority which selected the latter type. As for the Text category, Continuous Text (No. 28) was the most frequent selection of most ratings, although preferences for other types of texts, especially Segmented Text (No. 29) were also reported by a number of ratings. Finally, while the Drawing format category was a relatively high choice, no specific type of drawing could be associated with one or more of the ratings.

(7) IC-7: Theory and Principles of Operation of Equipment/Hardware, Its Components or Component Parts (Tables 17 and 18)

Format Categories: Three format categories (Drawing, Diagram, and Text) were chosen by at least 50% of the total subjects (although not in every rating), while 20% to 49% also chose Photo and Table format categories. Ratings with at least 50% of the subjects selecting the Drawing category were GM, FT, DS, ET, CM, BT, MM, EM, AE, and AT; and selecting the Diagram category, ST, FT, DS, ET, CM, EM, IC, AE, and AT. By comparison, the Text format was a choice of at least 50% in every rating. In the

TABLE 17

Technical Information Classification: Theory and principles of operation of equipment/hardware, its components, or component parts. (IC-7)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	3	6	12	3	12	4	-
GM (16)	1	4	11	5	-	10	6	-
FT (16)	-	6	8	14	6	13	8	1
TM (10)	1	3	4	4	-	5	2	-
DS (8)	-	4	4	8	3	7	4	1
ET (16)	-	4	8	14	3	14	6	3
CM (9)	-	4	7	5	-	6	2	-
BT (15)	-	5	12	3	-	14	6	1
MM (15)	1	4	8	5	1	13	-	-
EM (15)	-	3	11	8	3	13	5	1
IC (17)	-	3	8	14	3	15	6	1
AM (14)	2	2	3	4	-	11	-	-
AO (16)	1	1	7	2	-	12	4	-
AE (19)	1	10	11	10	-	13	6	1
AT (18)	-	4	10	17	1	14	4	-
Total (219)	7	60	118	125	23	172	63	9

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: Theory and principles of operation of equipment/hardware, its components, or component parts. (IC-7)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																							
Format Category:		Photo		Drawing								Diagram													
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
Rating																									
ST (15)		3		1	1		2	1		1	2	4	2	5	1	2	2	2	2		4	3		2	
GM (16)	1	4			2		3		4	5	1			2		1	2								
FT (16)		4	2	1	3	1	6	2	2	2	2	9	6	10	3	1	7	3	3	3	5	4		1	
TM (10)	1	3		1	3	1	1	1	1	3	1	2	1	1			3								
DS (8)		4	1		3		1	1		1		7	5	4	3	3	5	4	1	3		5		3	
ET (16)		3	2	1	3	2	5	4	3	4	2	9	11	8	4	4	9	2	3	1	6	5	2	2	
CM (9)		4			3		3	2	3	1	3	1	2	1	1		1		2				1		
BT (15)		5		1		1			3	6	7		1	1			1				1				
MM (15)	1	4		1	4	1	2	1	2	4	1	2	3	2			2							1	
EM (15)		2	1	1	1	2	3	2	3	2	2	1	1	4	2	1			3			4	1	1	
IC (17)		2	1	1	3		4	1	2	3	1	7	4	7		1	5		3		1	1	2		
AM (14)	2	2			1					2	1			2							2				
AO (16)	1	1			3		3	1	1	2	2	1		1											
AE (19)	1	9	1	2	3	2	2	5	1	4	3	8	2	4	5	1	4	1	2	1	1	1	1	1	
AT (18)		4			3	2	5	3	1	2	3	12	8	9	4		6		4	1	1				
Total (219)	7	54	8	10	36	12	40	24	26	42	31	63	46	61	23	14	47	12	23	9	21	23	7	11	

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 18

TABLE 18 (cont'd)

Technical Information Classification: Theory and principles of operation of equipment/hardware, its components, or component parts. (IC-7)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)	2	1	1	1	10	2	2	1	1	1	1			
GM (16)			3	3	7	3	1	1	1		2	1		
FT (16)	5	4	3	1	12	3	3	2	2		4	2	1	1
TM (10)			2	1	3	2	1	1	1		1	1		
DS (8)	3		1	2	6	1	2	3			1	1		1
ET (16)	3	1	2	1	12	7	4	3	1		1	1		3
CM (9)			5	5	3	1	1	1	1		1			
BT (15)			3	3	6	4	1	3			3	1		1
MM (15)		1	3	2	8	3								
EM (15)	2	2	3	2	5	6	1		2	1	2			1
IC (17)	1	2	1	1	10	7	1	2	4	1	2	3	1	
AM (14)			3	1	3	4								
AO (16)			4	1	5	3		1			1	3		
AE (19)			6	2	5	5	1	2	1		4	1	1	1
AT (18)	1		3		8	4		3			1	1		
Total (219)	17	11	43	26	103	55	18	23	14	3	24	15	3	8

case of Photo and Table formats, selection by 50% or more in a rating occurred only in the case of DS's (Photo and Table), AE's (Photo), and FT's (Table).

Format Types: The Drawing format types produced no particular patterns among the ratings. By contrast, at least a majority of subjects in the FT, DS, ET, and AT ratings selected two or three formats from the Overall Block Diagram (No. 11), Detailed Block Diagram (No. 12), Schematic Diagram (No. 13), Functional Signal Flow Diagram (No. 16) and Timing Diagram (No. 21) types; while the number of subjects in most of the other ratings who chose any type of diagram was insignificant. Continuous Text (No. 28) was the overall highest choice among types of texts, though 50% or more of those in only the ST, FT, DS, ET, MM, and IC ratings selected it. However, in the majority of ratings, Continuous Text was chosen more often than any other type of text. Selection of the Photograph (No. 1) format type showed some variation by ratings; while there was little variation by ratings in number and kind of selections of format types of Tables (No's. 30-35).

(8) IC-8: How to Use Hand Tools and Testing Equipment in Maintaining Equipment/Hardware (Tables 19 and 20)

Format Categories: Though preferred by less than 50% of the total subjects, Text and Table formats were still much more frequently selected than other formats. However, at least 50% of those in the GM, FT, DS, ET, EM, AO, and AT ratings chose Text, while only the DS rating was able to meet this criterion for the Table format. DS's were also unique in that half of them selected the Drawing format.

Format Type: Only Directive Text (No. 26) and Procedures Table (No. 34) obtained a relatively high number of selections. Just half of the subjects

TABLE 19

Technical Information Classification: How to use hand tools and testing equipment in maintaining equipment/hardware. (IC-8)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	7	1	1	1	1	4	4	-
GM (16)	5	4	4	-	-	10	6	-
FT (16)	5	2	6	3	1	8	7	-
TM (10)	5	-	1	2	-	3	1	-
DS (8)	1	-	4	1	-	5	4	-
ET (16)	1	2	3	4	-	11	2	-
CM (9)	2	2	3	3	-	4	4	-
BT (15)	6	1	1	2	1	5	4	-
MM (15)	7	-	3	1	-	7	5	-
EM (15)	3	1	1	1	-	9	4	-
IC (17)	7	1	2	4	1	6	8	-
AM (14)	8	-	2	-	-	5	2	-
AO (16)	7	1	2	1	-	8	3	-
AE (19)	8	5	3	1	1	8	7	-
AT (18)	6	3	4	2	-	11	4	-
Total (219)	78	23	40	26	5	104	65	-

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: How to use hand tools and testing equipment in maintaining equipment/hardware. (IC-8)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																						
Format Category:		Photo		Drawing								Diagram												
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)	7	1					1															1		
GM (16)	5	3	1		1		2			1														
FT (16)	5	2			1		5	1	1			1							1		1	1	1	1
TM (10)	5			1			1			1										1			1	
DS (8)	1			1	1		2									1	1							
ET (16)	1	2			2					1	1	1	1								1		2	1
CM (9)	2	1	1		3		1	1				1											1	2
BT (15)	6	1				1	1			1				1									1	
MM (15)	7			1	2				1	1													1	
EM (15)	3	1					1							1										
IC (17)	7	1					1		1					2			1		1		1	1	3	
AM (14)	8				1		1																	
AO (16)	7	1			1					1						1								
AE (19)	8	5			1		2					1												
AT (18)	6	3					3	1	2	2											1		1	
Total (219)	78	31	2	3	13	1	21	3	5	8	1	4	1	4	-	2	2	-	2	1	4	3	11	4

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 20

TABLE 20 (cont'd)

Technical Information Classification: How to use hand tools and testing equipment in maintaining equipment/hardware. (IC-8)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)	1	1	3		1	1					4			
GM (16)			8		1	2		1	1		5	1		
FT (16)	1	1	6	2	2	1	2	1	1		6	1		
TM (10)			3	1	1	1		1	1		1			
DS (8)			4	1	1	1	1				2	1		
ET (16)			7	1	6	2	1		1		2			
CM (9)			4	2	2		1	1	2		3			
BT (15)		1	3	1	4	1	1	1	2		2	1		
MM (15)			6			1	1		3		1			
EM (15)			6	1		2					4			
IC (17)	1	1	2		3	3			3	1	6			
AM (14)			4			1			1		1			
AO (16)			3	3	4						3			
AE (19)	1		6		2	1		1	2		6			
AT (18)			7	3	1	1		1	2		3			
Total (219)	4	4	72	15	28	18	7	7	19	1	49	4	-	-

in the GM and DS ratings chose Directive Text, for the highest percentage among the ratings for any of the format types.

(9) IC-9: Basic Safety Rules or Special Safety Precautions for Working on Equipment/Hardware (Tables 21 and 22)

Format Categories: At least half, and in most instances the great majority, of the subjects in every rating selected the Text format category. The Table, Drawing, Diagram, and Photo formats were chosen by a small number of subjects in most ratings. The Graph and Matrix format categories were unanimously rejected by virtually all ratings.

Format Type: Directive Text (No. 26), as compared to other types of text, was overwhelmingly the greatest choice of every rating.

(10) IC-10: Procedures: That is, Procedures for Assembly / Disassembly, Troubleshooting, Testing, Maintenance, etc. of Equipment/Hardware (Tables 23 & 24)

Format Categories: Four format categories (i.e., Drawing, Diagram, Text, and Table) were chosen by 50% or more of all the subjects. Twenty percent also selected the Photo category. The Graph category selected by 15%, obtained its highest acceptance in this information category.

At least 70% in the ratings indicated selected the following formats: (1) Drawing: GM, FT, TM, DS, ET, CM, BT, IC, AE, and AT; (2) Diagram: FT, ET, IC, and AT; and (3) Table: DS, ET, and EM. Ratings in which less than half the subjects selected these formats were: (1) Drawing: AM; (2) Diagram: GM, TM, CM, BT, MM, and AM; and (3) Table: ST, TM, BT, IC, AM, and AT. The Text format was preferred by at least 50% of every rating, except TM. The majority of preferences for Photos came from personnel in the FT, ET, CM, AE, and AT ratings.

TABLE 21

Technical Information Classification: Basic safety rules or special safety precautions for working on equipment/hardware. (IC-9)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	-	1	2	-	11	3	-
GM (16)	1	2	1	2	-	14	4	-
FT (16)	-	3	2	-	-	15	1	-
TM (10)	1	2	1	1	-	5	2	-
DS (8)	-	1	3	-	-	8	3	-
ET (16)	-	4	3	2	-	14	3	-
CM (9)	1	1	4	2	-	6	2	-
BT (15)	1	-	3	1	-	13	2	-
MM (15)	-	2	2	1	-	13	5	-
EM (15)	-	1	-	-	-	15	-	-
IC (17)	5	1	3	1	-	12	4	-
AM (14)	4	-	2	-	-	9	-	-
AO (16)	1	3	2	2	-	13	2	-
AE (19)	4	3	1	-	1	14	4	-
AT (18)	-	4	4	3	-	11	4	-
Total (219)	18	27	32	17	1	173	39	-

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: Basic safety rules or special safety precautions for working on equipment/hardware. (IC-9)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																							
Format Category:		Photo		Drawing								Diagram													
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)							1							2	1		1							
GM (16)	1	2			1							1			1									
FT (16)		3			2		1																	
TM (10)	1	2		1																	1			
DS (8)		1			2					1														
ET (16)		1	3	1				3						2										
CM (9)	1	1		2				2		1	1	1											1	1
BT (15)	1			1	1						1				1	1								
MM (15)		2		1	1								1											
EM (15)		1																						
IC (17)	5	1		1	1		1				1												1	
AM (14)	4			1	1																			
AO (16)	1	3		1	1										1						1			
AE (19)	4	3						1																
AT (18)		4		1	2		1		1	1	1	1			1		1						1	
Total (219)	18	24	3	10	12		4	6	1	3	4	3	1	4	5	1	2				2		3	1

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 22

TABLE 22 (cont'd)

Technical Information Classification: Basic safety rules or special safety precautions for working on equipment/hardware. (IC-9)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)			9	1	1		1	1			1			
GM (16)			14	3	1	2	1	1			3	1		
FT (16)			14	1	2	1	1	1						
TM (10)			5	1				1			1			
DS (8)			5	1	4						2	1		
ET (16)			13	1	1	4					3			
CM (9)			4	2							2			
BT (15)			9	1		5	2	1						
MM (15)			9		3	1	1	3			3			
EM (15)			14	1		1								
IC (17)			8	3	2	2		1			2	2		
AM (14)			8		1									
AO (16)			9		1	3		1			1	1		
AE (19)		1	12	3	3	1		3			2			
AT (18)			10		1	2		1			3	2		
Total (219)	-	1	143	18	20	22	6	14	-	-	23	7	-	-

TABLE 23

Technical Information Classification: Procedures: That is, procedures for assembly/disassembly, troubleshooting, testing, maintenance, etc. of equipment/hardware. (IC-10)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	1	9	8	4	11	7	-
GM (16)	-	1	15	6	1	13	9	-
FT (16)	-	5	13	14	6	12	8	1
TM (10)	-	1	7	3	-	4	4	-
DS (8)	-	2	7	5	3	7	6	1
ET (16)	-	6	15	14	6	14	12	3
CM (9)	-	6	8	4	1	7	5	1
BT (15)	-	-	12	6	-	12	4	1
MM (15)	-	-	10	7	-	11	9	1
EM (15)	-	1	10	10	3	8	11	1
IC (17)	-	1	15	12	3	15	7	-
AM (14)	1	3	6	1	-	11	1	-
AO (16)	-	2	9	8	1	11	9	-
AE (19)	-	7	14	11	1	14	11	2
AT (18)	-	7	15	16	4	12	6	-
Total (219)	1	43	165	125	33	162	109	11

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 24

Technical Information Classification: Procedures: That is, procedures for assembly/disassembly, troubleshooting, testing, maintenance, etc. of equipment/ hardware. (IC-10)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																						
Format Category:		Photo		Drawing								Diagram												
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)		1		1			1		3	9	1	2	3	6	2	1	5	3	2	2	1	3	2	3
GM (16)		1		1		1	2	2	6	13	2			2	3	1	1						2	1
FT (16)		5		1	3	2	6	5	7	13	7	5	6	10	7	5	8	4	4	4	1	4	3	6
TM (10)		1		1	2	1	1	1	1	6	3	3	2	2	3	1					1	1	1	1
DS (8)		2		2	2	1	1	2	3	5	3	1	1	2	3	2	3	2		1		2	1	2
ET (16)		5	1	1		2	1	4	7	14	5	6	8	9	8	6	9	4	7	5	2	4	8	6
CM (9)		4	2	1	1	2	3	2	5	8	4		2	3	3	1	2	1	3		2	1	2	2
BT (15)				1		2	1	2	4	11	3	1	3	1							1	1	1	
MM (15)				1	1	4	4	3	4	9	3	1	2	2	1	1	2	1	1	1	1	2	3	3
EM (15)		1						1	2	8	2			5	3		1		1		2		1	
IC (17)		1			1		2	3	7	12	3	2	4	8	5	4	6		1		3	1	5	3
AM (14)	1	3						1	2	5	1			1										
AO (16)		2					1	4	3	6	1	2	1	2	2	1	1		2				2	
AE (19)		6	1				1	2	6	13	2	1		3	5		3		2				1	3
AT (18)		7	1	1	3	3	3	4	8	10	6	6	7	10	8	3	8	4	5	2	2	5	4	2
Total (219)	1	39	5	11	13	18	27	36	68	142	46	30	39	66	53	26	49	19	28	15	16	24	36	32

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: Procedures: That is, procedures for assembly/disassembly, troubleshooting, testing, maintenance, etc. of equipment/hardware. (IC-10)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)	4		9	1	2	2	2	1	1	2	4			
GM (16)	1	1	11	2	1	1			4		7	1		
FT (16)	6	1	10	3	3	4	1	2	3	1	7	2	1	1
TM (10)			4	1	1	1	1	2	1	1	3	1		
DS (8)	3		5	1	2	1	2	1	2	2	5			1
ET (16)	6	2	11	5	4	3	3	1	7	4	11	4	2	3
CM (9)		1	7	4	4		1	4	4	1	3	3		1
BT (15)			8	3		6	1	1	2	1	2	2	1	
MM (15)			10	1	1	1	1	2	5		5		1	
EM (15)	3	1	6	2		2	1		4	3	8	1		1
IC (17)	3		10	3	3	4		1	3		6			
AM (14)			7			4					1			
AO (16)	1		10	1	1			3	1		7	1		
AE (19)	1		6	4	2	6	1	1	1	1	8		1	1
AT (18)	4		6	1	1	5	1	1	2		2	4		
Total (219)	32	6	120	32	25	40	15	20	40	16	79	19	6	8

TABLE 24 (cont'd)

Format Types: Preferences for format types were as follows:

(1) Drawings: Disassembled (Exploded) View (No. 9), followed by Assembled View (No. 8) and Cut-Away View (No. 10), were the most frequently selected types. More than half of the subjects in all ratings except AM and AO selected Disassembled (Exploded) View. Assembled View drawings were most frequently chosen by GM's, FT's, ET's, CM's, IC's, AE's, and AT's; and Cut-Away View, by FT's, ET's, CM's, and AT's. FT's indicated a greater requirement for Two-Dimensional View (No. 6) and Three-Dimensional View (No. 7) drawings than did other ratings.

(2) Diagrams: Although Schematic Diagram (No. 13), Wiring Diagram (No. 14), and Functional Signal Flow Diagram (No. 16) were more frequently chosen than other diagrams, most diagram types receive a relatively high fractional preference. The clearest distinction by ratings was in the number, rather than the type, of diagrams chosen. ST's, FT's, DS's, ET's, CM's, IC's, and AT's indicated a preference for a large number of diagrams, while GM's, TM's, BT's, MM's, EM's, AE's, and especially AM's indicated a preference for fewer diagrams.

(3) Text: Directive Text (No. 26) was the first choice of every rating, and it was the choice of 50% or more of the personnel in the ST, GM, FT, DS, ET, CM, BT, MM, IC, AM, and AO ratings. BT's, AE's, and AT's were more inclined than other ratings to select Segmented Text (No. 29). Except for a few selections from the ET, CM, and AE ratings, the preferences for Deductive Text (No. 27 or Continuous Text (No. 28) were negligible.

(4) Table: Although Procedures Table (No. 34) and secondly Materials List (No. 32) were more frequently chosen than other types of tables, there were only two instances (DS and ET for Procedures Table) in which a majority

of the subjects of any given rating selected any particular type of table. As with types of diagrams, the distinction among ratings with respect to selecting tables was more a matter of number of types of table selected than kind preferred. FT's, ET's, DS's, and EM's were the ratings which selected the highest number of tables. Only AM's expressed virtually no requirement for a Table format.

(5) Photo: The subjects who chose Photographs (No. 1) were primarily from the FT, ET, CM, AE, and AT ratings.

(6) Graph: Waveform (No. 24) was the strong format-type choice. Those ratings with more than one subject selecting Waveform were: ST, FT, DS, ET, EM, IC, and AT.

(11) IC-11: Calibrations, Settings, Torques, Clearances, etc. (Tables 25 and 26)

Format Categories: The Table format was selected by a majority of every rating except TM. Other but less significant choices for most ratings included Text, Drawing, and Diagram.

Format Types: Specialized Data Table (No. 35) and/or Procedures Table (No. 34) were the primary types chosen by every rating. While most ratings preferred both types, MM's were unique in their high preference for the Specialized Data Table only. In most cases, Directive Text (No. 26) was the text most preferred by individual ratings.

(12) IC-12: Connection and Functions of Components and Component Parts (Tables 27 and 28)

Format Categories: Diagram and Text, followed by Drawing and Table, were the main choices. Diagram was selected by the great majority if not all of the subjects in each of the ST, GM, FT, DS, ET, BT, EM, IC, AO, AE, and AT ratings. At least 50% of those in the GM, FT, DS, ET, CM, BT, MM,

TABLE 25

Technical Information Classification: Calibrations, settings, torques, clearances, etc. (IC-11)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	1	3	1	1	6	9	1
GM (16)	-	1	2	5	1	12	15	1
FT (16)	-	1	3	1	2	5	14	-
TM (10)	5	-	-	-	1	1	4	-
DS (8)	-	-	4	3	1	5	6	-
ET (16)	-	1	3	3	4	10	11	-
CM (9)	-	1	5	1	2	4	7	-
BT (15)	-	-	4	3	-	3	10	-
MM (15)	-	2	5	1	1	3	13	-
EM (15)	-	-	3	2	-	5	11	1
IC (17)	-	-	3	5	3	9	15	-
AM (14)	1	-	2	1	-	2	11	-
AO (16)	1	1	-	2	-	1	15	2
AE (19)	1	6	3	7	-	5	15	-
AT (18)	1	2	3	5	-	4	14	-
Total (219)	9	16	43	40	16	75	170	5

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: Calibrations, settings, torques, clearances, etc. (IC-11)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

		FORMATS																						
Format Category:		Photo		Drawing								Diagram												
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)		1					1		2	2							1							
GM (16)		1								1	1	1				1	1					2	3	1
FT (16)			1	1	1		1		1	1	1											1		
TM (10)	5																							
DS (8)					1	2	1		1													3		
ET (16)			1	1		2	1	1	2		1		1									1	2	1
CM (9)		1		2	1		1	2	2	1				1	1	1	1						1	1
BT (15)					1	1				2	3			2							2			
MM (15)		2			2	1					2										1	1		
EM (15)								1	1	1	1										1	1	1	
IC (17)							2	1			1		1					1	2				1	
AM (14)	1										2												1	
AO (16)	1	1																					2	
AE (19)	1	5	1					1	1	1	2	1	1	2	3								1	
AT (18)	1	2	1	1	1	1	2		2	1	1	1	2	1	1		3		1		2		2	2
Total (219)	9	13	4	5	7	7	9	6	12	10	15	3	5	6	5	2	6	1	3	-	6	9	14	5

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

TABLE 26

TABLE 26 (cont'd)

Technical Information Classification: Calibrations, settings, torques, clearances, etc. (IC-11)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)	1		3			3	1		1	1	5	6		1
GM (16)	1		8	1	1	5		1	2		7	10		1
FT (16)	1	2	5	1			2	2			8	8		
TM (10)		1	1	1	1	1					3	1		
DS (8)	1		4	1	1		1		1		4	2		
ET (16)	4	2	6	4	1	5	2		2		8	6		
CM (9)	1	1	4	3	3		1	2	1		3	5		
BT (15)			3		2	1	1		2		5	6		
MM (15)		1	1		3		2	1				11		
EM (15)			3			2			1		4	6	1	
IC (17)	3	2	3		3	4			2		9	8		
AM (14)			2								2	10		
AO (16)			1				4	4			7	11		2
AE (19)			4		1	1		8	2		7	4		
AT (18)			2		1	2		3			8	7		
Total (219)	12	9	50	11	17	24	14	21	14	1	80	101	1	4

TABLE 27

Technical Information Classification: Connections and functions of components and component parts (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.) (IC-12)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY BY RATINGS

	FORMAT CATEGORIES							
	None	Photo	Drawing	Diagram	Graph	Text	Table	Matrix
Rating								
ST (15)	-	1	7	13	-	7	5	-
GM (16)	-	3	11	14	-	8	6	-
FT (16)	-	1	4	16	2	11	5	2
TM (10)	4	2	5	4	-	2	3	-
DS (8)	-	-	5	8	1	6	5	2
ET (16)	-	6	12	13	1	12	5	-
CM (9)	1	1	8	6	1	6	2	-
BT (15)	-	-	6	13	-	9	3	1
MM (15)	-	2	8	9	-	10	2	-
EM (15)	-	-	-	15	-	8	1	-
IC (17)	-	2	8	17	1	10	3	-
AM (14)	2	1	4	8	-	4	2	-
AO (16)	-	4	6	12	-	5	3	-
AE (19)	2	5	9	15	2	10	3	-
AT (18)	-	2	8	17	1	6	2	2
Total (219)	9	30	101	180	9	114	50	7

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

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TABLE 28

Technical Information Classification: Connections and functions of components and component parts (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.) (IC-12)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS																							
Format Category:	Photo		Drawing								Diagram													
Format Type:	None	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Rating																								
ST (15)		1				3	1	2	3	6	3	4	4	6	6	5	6	1			2	2		1
GM (16)		1	2		1	2	4	3	3	7	6	1	4	10	5	6	6	1	1	1	6	1	1	
FT (16)		1		1	2	1	2		3	4	3	4	6	13	10	5	8	3	3	2	2	2	1	2
TM (10)	4	1	2	2	2	1	3	1	1	2	1	2	3	2	2	1	1		1	1	1			
DS (8)				1		1	3	3		1	2	2	2	4	4	5	3	2	2	5	1			1
ET (16)		3	3		2	2	2	4	9	9	6	7	6	7	6	6	9	1	3	1	3			
CM (9)	1	1			1	1	2	5	5	4	5	2	3	3	3	2	1	1	3	1	3	2	1	2
BT (15)						1	1	2	1	1	4	2	3	6	1	1	4		3					
MM (15)		2			2	1	1	1	2	3	4	1	2	5	2	1	3		1	1	1			
EM (15)												3	1	9	9	3	1	1	3	1				
IC (17)		2			1		2	4	4	3	4	4	3	11	10	6	6	2	4	2				
AM (14)	2		1						1	1	3			6			1		1					
AO (16)		4	1					1		5		1	5	9	7	1	1		2		1			
AE (19)	2	5		1		1		2	1	6	2	5	5	5	5	1	6		3		3			
AT (18)		2			1	1	1	4	4	4	5	10	5	8	7	4	4	1	1	1	3	2	2	
Total (219)	9	23	9	5	12	15	22	32	37	56	48	48	52	104	77	47	60	13	31	16	26	9	5	6

Note: The parenthetical number after each rating refers to the number of enlisted technicians interviewed.

Technical Information Classification: Connections and Functions of components and component parts (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.) (IC-12)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT TYPE BY RATINGS

	FORMATS													
Format Category:	Graph		Text				Table						Matrix	
Format Type:	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Rating														
ST (15)			3		4		1		1	2	1			
GM (16)			5	3	3	3	1	3	1	2		3		
FT (16)	2		2	2	9	6	3	3	3	4	2	1	2	2
TM (10)			2	1	1	1	1	3	1		1			
DS (8)	1		2	2	2	1	1		1	5		1	1	1
ET (16)	1		4	4	4	9	1	1	2	2	1	1		
CM (9)		1	5	4	3	1	1	1	1	1	2	1		
BT (15)			4	2	5		1		1		1	2	1	
MM (15)			2	1	5	1	1					1		
EM (15)					3	6			1					
IC (17)	1		2		2	6			2	3	1			
AM (14)			1			3			1		1			
AO (16)			3		1	1			1	1	1	1		
AE (19)	2	1	1	1	3	5		2		1	1			
AT (18)	1	1	2		2	2		1		1	1		2	1
Total (219)	8	3	38	20	47	45	11	14	16	22	13	11	6	4

TABLE 28 (cont'd)

EM, IC and AE ratings also chose Text. TM's had the lowest preference for both the Diagram and Text formats, while most of the Aviation ratings (AM, AO, AT) expressed a relatively low requirement for text. The largest requirement for Drawing came from the ST, GM, TM, DS, ET, CM, MM, IC, AE, and AT ratings; and for Table, from the ST, GM, FT, DS, and ET ratings.

Format Type: Schematic Diagram (No. 13) was the primary type of diagram selected by the subjects. Other diagram types for which preference was indicated included Wiring Diagram (No. 14), Functional Signal Flow Diagram (No. 16), Cabling Diagram (No. 15), Detailed Block Diagram (No. 12), and Overall Block Diagram (No. 11). Once again, differences by ratings were related more to the number of format types chosen than to the actual types themselves, with BT's and AM's selecting the fewest types.

Although more subjects selected Continuous Text (No. 28) and Segmented Text (No. 29) than other types, no particular text clearly dominated. ST's, AM's, AO's, and AT's expressed the lowest requirement for text.

Disassembled (Exploded) View (No. 9) and Cut-Away View (No. 10) received the highest number of choices among types of drawings. GM's, ET's, CM's, AE's, and AT's were more likely than the other ratings to select drawings.

Although the Table format was chosen by almost one in four subjects, no particular type of table stood out as a primary choice. The number of subjects expressing preferences for different types by ratings were too small and dispersed to be significant.

Pay Grades

In investigating whether particular format choices were related to

pay grade levels of Navy technicians, the survey responses of a sample of 100 subjects, evenly divided (25 each) among pay grades E4, E5, E6, and E7, were analyzed. The four groups were matched in number, rating representation, and civilian education, and it seemed reasonable to expect that they were satisfactorily matched in GCT scores. Since GCT scores were obtained only for some of the ratings (see subsection on GCT), it was not possible to match GCT scores with the same precision employed with rating representation and civilian education. The four groups were, however, considered to be fairly matched in the main characteristics which might affect format preferences.

Tables 29 to 40 contain the format choices for the sample of 100 subjects for each of the 12 information classifications. Two kinds of data are reported regarding format category choices: (1) the number of subjects in a pay grade group who selected a particular format category (Column A); and (2) the total number of format-type selections within a format category by the subjects (Column B). The numbers in Column B are of significance in computing an index of the need for a variety of format types. Column B divided by Column A in any instance will yield the average number of format types required by the subjects. However, the specific format types selected are not reported.

The patterns of format selection by the total sample were very similar to those for the entire survey population (see Table 3). The analysis by pay grades, as well as that by GCT and education, therefore focused on the same high-response cells (the 35 cells marked in Table 3) which were used in the analyses for total subjects and for ratings.

In addition to the results for format choices, "none" responses are

TABLE 29

Technical Information Classification: Nomenclature, terms, codes, and jargon, in one's occupational specialty. (IC-1)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	13	-	-	4	11	-	-	-	-	3	3	10	13	-	-
E6 (25)	9	1	1	1	1	1	2	-	-	5	5	13	15	-	-
E5 (25)	11	1	1	2	3	3	3	1	1	7	7	13	15	-	-
E4 (25)	7	-	-	1	1	1	1	-	-	4	5	14	22	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware. (IC-2)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	6	4	4	2	3	2	9	1	1	3	4	15	20	-	-
E6 (25)	5	6	7	6	10	4	7	-	-	9	11	13	19	-	-
E5 (25)	4	3	3	8	14	4	8	-	-	9	10	19	30	-	-
E4 (25)	7	4	4	3	6	1	1	-	-	9	10	9	13	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 30

TABLE 31

Technical Information Classification: Fundamental facts, basic names, and locations of components and component parts of equipment/hardware. (IC-3)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	-	5	5	18	48	7	18	-	-	10	11	9	13	1	1
E6 (25)	1	5	5	19	42	7	12	-	-	13	15	7	11	-	-
E5 (25)	4	5	6	13	26	8	9	-	-	16	20	9	15	1	1
E4 (25)	2	5	5	8	19	12	17	-	-	9	10	7	9	1	1

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: The meaning of technical symbols, acronyms and abstract terms. (IC-4)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	2	-	-	2	2	1	1	1	2	2	2	23	24	-	-
E6 (25)	1	1	1	4	7	1	1	-	-	7	7	21	27	-	-
E5 (25)	1	-	-	1	1	-	-	1	2	9	12	20	25	-	-
E4 (25)	3	1	1	2	2	1	1	-	-	8	11	14	18	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 32

TABLE 33

Technical Information Classification: The functions of components and component parts of equipment/hardware. (IC-5)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	2	2	2	13	29	14	31	1	1	17	18	2	3	-	-
E6 (25)	1	3	3	12	17	9	20	4	5	19	24	6	9	2	2
E5 (25)	3	3	3	8	16	11	25	1	1	16	24	6	10	-	-
E4 (25)	2	2	2	7	12	7	21	-	-	14	16	10	10	2	3

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: How components and component parts relate to the entire equipment/hardware system. (IC-6)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	1	1	1	10	21	18	52	-	-	13	14	3	3	-	-
E6 (25)	-	1	1	7	16	17	40	2	3	16	17	4	7	-	-
E5 (25)	1	1	1	8	18	15	37	2	2	13	18	3	3	-	-
E4 (25)	1	3	3	9	19	14	26	1	1	11	14	5	7	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 34

TABLE 35

Technical Information Classification: Theory and principles of operation of equipment/ hardware, its components, or component parts. (IC-7)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	3	5	5	16	56	17	53	2	3	22	29	8	16	1	2
E6 (25)	-	8	8	15	27	14	48	5	7	20	28	9	12	-	-
E5 (25)	-	8	10	13	24	13	37	2	2	21	27	8	10	-	-
E4 (25)	-	9	9	14	16	11	23	1	1	15	20	8	11	1	1

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: How to use hand tools and testing equipment in maintaining equipment/hardware. (IC-8)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	7	2	2	6	8	3	7	2	3	15	18	8	13	-	-
E6 (25)	8	3	3	7	9	6	10	1	1	13	15	10	13	-	-
E5 (25)	6	2	2	6	8	3	4	1	1	13	18	9	12	-	-
E4 (25)	5	4	4	6	9	1	1	-	-	13	17	8	10	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 36

TABLE 37

Technical Information Classification: Basic safety rules or special safety precautions for working on equipment/hardware. (IC-9)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	4	2	2	3	5	1	2	-	-	21	23	4	4	-	-
E6 (25)	1	3	3	3	4	6	10	-	-	19	23	5	5	-	-
E5 (25)	3	4	4	5	5	2	2	1	1	20	23	8	10	-	-
E4 (25)	-	2	2	5	6	3	3	-	-	19	25	6	6	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Procedures: That is, procedures for assembly/disassembly, troubleshooting, testing, maintenance, etc. of equipment/hardware. (IC-10)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	-	4	4	21	55	15	71	5	6	20	30	14	33	1	1
E6 (25)	-	6	6	20	50	15	63	5	6	21	24	15	24	1	1
E5 (25)	-	5	5	21	44	15	45	4	5	20	23	13	26	3	4
E4 (25)	-	3	3	17	27	12	39	3	3	16	25	11	14	1	1

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 38

TABLE 39

Technical Information Classification: Calibrations, settings, torques, clearances, etc. (IC-11)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	-	3	3	4	5	3	9	3	3	7	12	20	30	-	-
E6 (25)	1	2	2	9	14	7	8	1	1	10	14	20	31	2	2
E5 (25)	1	1	1	6	11	5	8	1	2	11	15	21	26	1	1
E4 (25)	1	1	1	4	6	3	6	3	3	11	17	16	27	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Connections and functions of components and component parts (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.) (IC-12)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY PAY GRADES

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Pay Grade		A	B	A	B	A	B	A	B	A	B	A	B	A	B
E7 (25)	-	3	4	15	34	21	70	2	2	14	21	6	12	-	-
E6 (25)	-	5	5	12	28	19	63	-	-	15	20	5	12	2	3
E5 (25)	-	4	4	14	27	20	50	-	-	12	16	10	12	1	2
E4 (25)	1	1	1	13	34	18	45	2	3	10	16	5	8	1	1

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 40

also reported. An indication of "none" for an information classification meant that a subject considered he required no information presentation for that kind of information when applying it in the performance of job tasks. It was assumed that experienced personnel (higher pay grades) would be less likely than inexperienced personnel to require the presentation of technical information in order to perform technical job tasks. The findings by pay grades supported this assumption. E7's had a greater tendency than other pay grades to indicate "none" for an information classification. In the eight information classifications in which there were a high number of "nones" (i.e., all classifications except IC-6, 10, 11, 12; see Tables 34, 38, 39, 40), E7's had the highest or second highest number of "nones" in seven; while by contrast E4's had the lowest or second to the lowest in five.

There was a general tendency for the higher pay grades to select a greater number of format categories than the lower pay grades. Similarly, the number of format-type selections was higher among the higher pay grades. This was particularly evident in the case of the Drawing and Diagram format categories. Tables 29-40 show that the number of format-type selections was greatest among E7's and lowest among E4's in most information classifications in which drawings and diagrams were dominant choices. For example, for IC-6 (Table 34), there were twice as many diagram format-type selections among the E7's as among the E4's (52 v. 26). For IC-7 (Table 35), format-type selections among the E7's for drawings were more than three times (56 v. 16) the number of format-type selections among E4's. In fact, the number of format-type selections made varied directly with pay grade level for the most commonly chosen format types of almost every information classification.

Although the selection pattern for the Text format was similar to that for drawings and diagrams, the tendency for increasing numbers of format-type selections with increasing pay grade levels was not as pronounced. However, E4's once again were least likely, as compared to the other pay grades, to select a Text format for the majority of information classifications (see Tables 31, 33, 34, 35, 36, 37, 38 and 40).

Finally, in the case of the Table format, the one consistent pattern was that E4's reported the lowest number of format-type selection (Column B) for most of the information classifications.

In summary, the main findings by pay grades were:

(1) Higher pay grade personnel were more likely than lower pay grade personnel to indicate no requirement for the presentation of technical information.

(2) Higher pay grade personnel tended to select a greater number of format categories than the lower grades for most information classifications.

(3) The number of format-type preferences reported for drawings and diagrams tended to be highest for E7's and lowest for E4's in most information classifications. This tendency was less significant in the case of Text and Table formats.

(4) The fraction of E4 personnel which selected the Text and Table formats was consistently lower than other pay grades in most information classifications, though not as pronounced as in the case of Drawing and Diagram formats.

Education

In analyzing whether format selections are related to civilian education level, two levels of education were used: (1) high school graduate

only ("H.S. only")[1] and (2) high school graduation and some college ("H.S. +"). Only 11 of the 219 subjects reported less than a high school education, and no one was a college graduate. Of the 208 high school graduates, 134 had a high school diploma only, and 74 had some college study.

Two groups of 25 subjects each were created (high school graduates only, and high school graduates with some college) in such a way that they were nearly identical in other personnel characteristics (i.e., in ratings, pay grades, and GCT scores represented). Because GCT scores could be obtained only for subjects in the FT, GM, BT, MM, EM, IC, AM, AO, AE, and AT ratings (see subsection on GCT), and because no AM had completed any college work, the sample selected was confined to nine ratings. The characteristics of the two groups are shown in Table 41.

The format selections of those in the two sample groups are reported in Tables 42-53. A summary of the main findings follows for the cells cited in Table 3; i.e., those cells representing format categories chosen by the highest fractions of subjects.

(1) "None" Column (i.e., there is no requirement for the presentation of this kind of information for most technical job tasks)

There was little difference between the "H.S. only" group and "H.S. +" group for the great majority of information classification in the number of subjects reporting no requirement for information presentation. Only in the cases of IC-1 (Table 42) in which more "H.S. only" subjects reported no requirement, and IC-8 (Table 49) in which more "H.S. +" subjects reported no requirement, were there differences.

---

[1]Included those with a high school diploma from a civilian institution, as well as those with an equivalent high school (General Education Development: G.E.D.) diploma.

TABLE 41

CHARACTERISTICS OF THE SAMPLE GROUPS USED IN ANALYZING EDUCATION LEVEL AS A FACTOR IN FORMAT PREFERENCES
(number of subjects)

Characteristics	Education Level: High School Graduation Only	Education Level: High School Graduation + Some College
1. Rating		
FT	3	3
GM	2	2
BT	2	2
MM	3	3
EM	3	3
IC	2	2
AO	4	3
AE	4	3
AT	2	4
Total	25	25
2. Pay Grade		
E4	4	4
E5	6	6
E6	8	8
E7	7	7
Total	25	25
3. GCT		
High Group[a]	12	12
Low Group[b]	13	13
Total	25	25

[a]Composed of subjects with GCT scores above the median score for the total GCT scores obtained.

[b]Composed of subjects with GCT scores below the median score for the total GCT scores obtained.

TABLE 42

Technical Information Classification: Nomenclature, terms, codes, and jargon, in one's occupational specialty. (IC-1)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	10	1	1	-	-	1	1	-	-	4	4	10	10	-	-
High School Graduate + Some College Education (25)	7	2	2	4	11	3	3	-	-	3	3	16	22	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware. (IC-2)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	7	6	6	3	4	2	5	-	-	9	9	13	15	-	-
High School Graduate + Some College Education (25)	8	2	3	4	5	3	10	-	-	4	5	14	19	1	1

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 43

TABLE 44

Technical Information Classification: Fundamental facts, basic names, and locations of components and component parts of equipment/hardware. (IC-3)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	3	4	4	12	17	10	21	-	-	15	15	7	9	-	-
High School Graduate + Some College Education (25)	2	3	4	16	46	9	21	-	-	16	17	5	8	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: The meaning of technical symbols, acronyms and abstract terms. (IC-4)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	-	2	2	2	9	2	14	1	2	5	7	21	23	-	-
High School Graduate + Some College Education (25)	-	-	-	2	5	1	1	1	2	5	6	23	31	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 45

TABLE 46

Technical Information Classification: The functions of components and component parts of equipment/hardware. (IC-5)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	1	2	2	8	12	13	21	-	-	20	23	4	7	1	1
High School Graduate + Some College Education (25)	3	-	-	12	16	10	31	2	2	20	24	4	7	2	3

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: How components and component parts relate to the entire equipment/hardware system. (IC-6)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	-	1	1	9	9	17	32	2	2	17	19	2	3	-	-
High School Graduate + Some College Education (25)	1	2	2	13	27	18	43	-	-	14	16	4	8	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 47

TABLE 48

Technical Information Classification: Theory and principles of operation of equipment/hardware, its components, or component parts. (IC-7)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	-	3	3	15	22	12	25	3	2	19	26	9	9	-	-
High School Graduate + Some College Education (25)	1	5	5	18	42	15	37	2	2	20	24	8	12	1	2

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: How to use hand tools and testing equipment in maintaining equipment/hardware. (IC-8)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	4	4	4	9	10	3	3	-	-	18	19	7	8	-	-
High School Graduate + Some College Education (25)	9	1	1	6	10	2	5	1	2	12	15	9	12	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 49

TABLE 50

Technical Information Classification: Basic safety rules or special safety precautions for working on equipment/hardware. (IC-9)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	-	4	4	5	5	1	1	1	1	23	23	7	9	-	-
High School Graduate + Some College Education (25)	3	-	-	4	5	2	2	-	-	19	20	5	6	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Procedures: That is, procedures for assembly/disassembly, troubleshooting, testing, maintenance, etc. of equipment/ hardware. (IC-10)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	-	4	4	15	31	17	47	3	3	18	21	10	12	1	1
High School Graduate + Some College Education (25)	-	7	7	22	53	15	60	2	2	18	22	19	31	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 51

TABLE 52

Technical Information Classification: Calibrations, settings, torques, clearances, etc. (IC-11)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	-	2	2	3	5	3	3	1	1	9	12	21	25	2	2
High School Graduate + Some College Education (25)	-	3	3	9	14	2	3	-	-	8	10	22	31	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Connections and functions of components and component parts (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc. (IC-12)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY EDUCATION

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
Education		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High School Graduate Only (25)	-	3	3	10	18	22	68	1	2	16	17	4	5	1	2
High School Graduate + Some College Education (25)	-	5	6	14	30	24	66	3	5	11	15	4	14	1	1

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample. None of those interviewed was a college graduate; thus the second group above had less than 4 years of college.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 53

(2) Photo Format Selection

There was no overall difference between the "H.S. +" group and the "H.S only" group with respect to the number of subjects reporting a need for photographs. In six information classifications, "H.S. +" subjects reported a higher number than the "H.S. only" subjects for the Photo category (Column A) and for total format types selected (Column B). In six other information classifications, higher numbers were reported for "H.S. only" subjects than for "H.S. +" subjects.

(3) Drawing Format Selection

The fraction of the "H.S. +" group which chose formats in the Drawing category was significantly higher than the "H.S. only" group (Column A), as well as in the total number of drawing-type selections (Column B), for the cells cited in Table 3 for every information classification. (See Tables 44, 46, 47, 48, 51, 52, and 53)

(4) Diagram Format Selection

With respect to choosing the Diagram category (Column A), there was very little difference between the "H.S. only" and "H.S. +" groups. However, the "H.S. +" group chose a significantly greater number of diagram types (Column B) in IC's 5, 6, 7 and 10. (See Tables 46, 47, 48 and 51). The reverse was true in IC-4 (see Table 45).

(5) Text Format Selection

Differences between the "H.S. only" and "H.S. +" group were not sufficiently consistent throughout the information classifications or significant for any single information classification to warrant emphasis.

(6) Table Format Selection

Although little difference was found between the "H.S. only" and

"H.S. +" groups with respect to choosing the Table format (Column A), the "H.S. +" group reported consistently higher total number of table types selected (Column B). See IC's 1, 2, 4, 6, 7, 8, 10, 11, and 12 (Tables 42, 43, 45, 47, 48, 49, 51, 52, and 53)

In summary, the main differences in format preference attributable to educational level were:

(1) "H.S. only" and "H.S. +" personnel did not vary significantly in the number reporting no need for information presentation.

(2) Higher fractions of the "H.S. +" group than of the "H.S. only" group tended to choose the Photo and Drawing categories, and significantly higher total numbers of format types for drawings, diagrams, and tables were selected by the "H.S. +" group.

GCT

GCT scores for the BT, MM, EM, IC, GM, FT, AM, AO, AE, and AT ratings were obtained from the cooperating Commands for 134 of the 161 subjects in these ratings. Since GCT scores could not be obtained for the other ratings surveyed, the question of the relationship of GCT to format preferences was confined to the above ten ratings.

The 134 GCT scores were divided at the median, and two groups were created -- one with GCT scores above the median, and the other with GCT scores below the median. The former group is referred to as the high (H) group; and the latter, the low (L) group. From the 134 subjects, it was possible to create two groups of 40 subjects each, fairly evenly matched in rating representation, pay grades, and civilian education. The characteristics of the two groups are shown in Table 54.

TABLE 54

CHARACTERISTICS OF THE SAMPLE GROUPS COMPARED
IN ANALYZING GCT AS A FACTOR IN FORMAT PREFERENCES
(number of subjects)

Characteristics	GCT Scores: High Group	GCT Scores: Low Group
1. Rating		
FT	5	3
GM	3	4
BT	3	5
MM	4	4
EM	4	3
IC	3	3
AM	3	5
AO	5	4
AE	5	5
AT	5	4
Total	40	40
2. Pay Grade		
E4	2	3
E5	4	6
E6	20	19
E7	14	12
Total	40	40
3. Education		
H.S. only[a]	26	27
H.S. +[b]	14	13
	40	40

[a] H.S. only: high school graduate only

[b] H.S. +: high school graduate and completed some (but less than 4 years) college.

The formats selected by those in the two sample groups are reported in Tables 55-66. A summary of the main findings follows for the IC/Format Category cells cited in Table 3.

(1) "None" Column (i.e., no requirement for the presentation of this kind of information for most technical job tasks)

A greater number of L group subjects than H group subjects in nine of the twelve information groups indicated no requirement for technical information presentation. The L group recorded substantially higher numbers than the H group in five of these classifications (See Tables 57, 58, 59, 63, and 65), and the fraction reporting no requirement was equal for the two groups in two information classifications. (See Tables 61 and 62)

(2) Photo Format Selection

No real difference existed between the H and L groups in Photo format selection for the two cells cited in Table 3. (See Tables 61 and 64). However, it should be noted that a significantly higher fraction of L group rather than H group subjects selected photographs in IC-1 and IC-12.

(3) Drawing Format Selection

Selection of the Drawing format was significantly more characteristic of the H group than the L group. Not only did a higher fraction of the H group designate the format category (Column A) in five of seven Table 3 cells (see Tables 57, 59, 60, 61, 64, 65, 66), but the total number of format types chosen (Column B) by the H group was higher in all twelve information classifications, and <u>significantly</u> higher in most.

(4) Diagram Format Selection

The H group recorded a greater preference for the Diagram Format Category than the L group (Column A) in five of six Table 3 cells. (See

TABLE 55

Technical Information Classification: Nomenclature, terms, codes, and jargon, in one's occupational specialty. (IC-1)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	15	1	1	5	13	-	-	-	-	4	4	22	26	-	-
Low Group (40)	16	6	6	2	2	1	2	1	1	5	5	17	21	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware. (IC-2)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	15	7	8	9	12	1	1	-	-	11	12	16	22	1	1
Low Group (40)	13	7	7	2	2	3	7	-	-	10	10	19	27	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample..

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 56

TABLE 57

Technical Information Classification: Fundamental facts, basic names, and locations of components and component parts of equipment/hardware. (IC-3)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	4	8	9	20	49	11	20	-	-	23	25	9	11	-	-
Low Group (40)	11	6	6	10	21	13	25	-	-	15	15	11	17	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: The meaning of technical symbols, acronyms, and abstract terms. (IC-4)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES															
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	1	1	1	3	13	1	13	-	-	8	12	35	41	-	-
Low Group (40)	8	3	3	4	5	2	2	1	1	7	7	28	36	2	2

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 58

TABLE 59

Technical Information Classification: The functions of components and component parts of equipment/hardware. (IC-5)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	2	5	6	11	24	22	40	1	1	32	36	7	11	3	3
Low Group (40)	7	5	5	14	21	12	24	3	4	19	19	6	6	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: How components and component parts relate to the entire equipment/hardware system. (IC-6)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	2	2	2	14	25	30	65	1	1	23	26	5	9	-	-
Low Group (40)	3	3	3	10	18	17	35	1	1	12	12	8	8	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 60

TABLE 61

Technical Information Classification: Theory and principles of operation of equipment/hardware, its components, or component parts. (IC-7)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	1	9	9	19	45	21	62	2	2	35	45	13	18	1	2
Low Group (40)	1	8	8	20	30	17	39	2	3	32	37	10	11	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: How to use hand tools and testing equipment in maintaining equipment/hardware. (IC-8)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	16	6	6	12	17	4	4	-	-	20	23	8	15	-	-
Low Group (40)	16	4	4	3	5	4	5	2	3	15	17	13	15	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 62

TABLE 63

Technical Information Classification: Basic safety rules or special safety precautions for working on equipment/hardware. (IC-9)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	3	6	6	5	8	2	2	-	-	32	36	6	9	-	-
Low Group (40)	6	8	8	2	2	2	3	1	1	27	32	8	12	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Procedures: That is, procedures for assembly/ disassembly, troubleshooting, testing, maintenance, etc. of equipment/hardware. (IC-10)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	-	9	9	33	89	22	97	7	7	29	39	20	30	-	-
Low Group (40)	1	8	8	24	45	18	41	2	3	27	34	17	26	4	5

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 64

TABLE 65

Technical Information Classification: Calibrations, settings, torques, clearances, etc. (IC-11)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	-	4	4	8	13	4	8	1	1	9	13	34	44	1	1
Low Group (40)	3	4	4	6	10	11	19	2	3	12	17	30	41	-	-

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

Technical Information Classification: Connections and functions of components and component parts (e.g., electrical/electronic circuit arrangements; hydralic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.) (IC-12)

SELECTION OF FORMATS BY ENLISTED TECHNICIANS
COUNTS FOR EACH FORMAT CATEGORY AND FOR TOTAL FORMAT TYPES WITHIN EACH FORMAT CATEGORY
BY GCT

	FORMAT CATEGORIES													
	None	Photo		Drawing		Diagram		Graph		Text		Table		Matrix	
GCT		A	B	A	B	A	B	A	B	A	B	A	B	A	B
High Group (40)	-	4	5	17	44	35	116	3	4	24	29	10	22	2	3
Low Group (40)	1	8	8	16	32	29	58	2	3	21	24	7	11	2	3

Note: The parenthetical number after each rating refers to the number of enlisted interviews included in the sample.

Column A = Number of enlisted technicians who selected the format category.

Column B = Total number of format-type selections within the format category by the enlisted technicians.

TABLE 66

Tables 57, 59, 60, 61, 64, and 66). The significant difference between the H and L groups, as reported above for the total number of drawing-type selections, was often even greater in the case of diagram format types. Specifically, the total number of diagram format-type selections recorded by the H group were 40, 65, 62, 97, and 116 for IC's 5, 6, 7, 10, and 12 respectively, as compared to 24, 35, 39, 41, and 58 for the L group. However, for six other IC's (1, 2, 3, 8, 9, and 10) the total number of diagram format types chosen was rather low, but slightly higher in the L group.

(5) Text Format Selection

The H group indicated a greater preference than the L group for the Text Format in 10 of 11 Table 3 cells. (The exception was IC-11; see Tables 56-66). However, the difference between the two groups was large in only three information classifications: IC-3, IC-5 and IC-6. (See Tables 57, 59 and 60).

(6) Table Format Selection

Although the H group indicated a greater preference than the L group in six of the nine Table 3 Information Classification/Format Category cells, the difference between the two groups for most of the information classifications was not as great as it was in the case of the other formats previously described. (See Tables 55, 56, 57, 58, 61, 62, 64, 65 and 66).

In summary, the main findings by GCT were:

(1) The L group was consistently higher than the H group in reporting no requirement for the presentation of technical information.

(2) The number of personnel indicating a requirement for the Drawing and Diagram formats, and in particular the total number of types selected

for each format category, was significantly higher for the H group than for the L group.

(3) The H group was consistently higher than the L group in the number of personnel reporting a requirement for Text and Table formats, but the differences were not as great as in the case of the Drawing and Diagram formats.

IV. CONCLUSIONS

A. Forward

This study was undertaken to assist in the development of a model for selecting effective formats for presenting technical information to Fleet technicians. An underlying assumption in the effort was that, in order to be effective, presentation formats must be appropriate to the nature of job tasks and to variations in characteristics of job task performers. A model for selecting effective formats must thus relate three factors: Classifications of Job Task Information, Personnel Characteristics, and Presentation Modes.

B. Hypotheses and the Survey Findings

Findings from the survey which are of interest in evaluating the hypotheses are presented in Section 2 as follows:

1. Hypothesis 1 and Findings

a. Hypothesis: The need for any kind of information presentation for job-task performance will vary according to aptitude. Personnel with higher aptitude scores will be less likely than those with lower aptitude scores to require information presentation for any of the classifications of job task information.

b. Findings: The higher (H) GCT group was consistently less likely than the lower (L) GCT group to report NO requirement for information presentation in the various information classifications. These findings did NOT support the hypothesis.

2. Hypothesis 2 and Findings

a. Hypothesis: The need for any kind of information presentation for job-task performance will vary according to civilian education level. Per-

sonnel with higher civilian education will be less likely than those with lower civilian education to require information presentation for any of the classifications of job task information.

b. Findings: Subjects with high school diplomas only ("H.S. only") did not vary significantly from subjects with a high school diploma and some college education ("H.S. +") in reporting NO requirement for information presentation with respect to the various information classifications. These findings did NOT support the hypothesis.

3. Hypothesis 3 and Findings

a. Hypothesis: The need for any kind of information presentation for job-task performance will vary according to pay grade level. Those personnel in higher pay grades will be less likely than those in the lower pay grades to require information presentation for any of the classifications of job task information.

b. Findings: Subjects in higher pay grades were slightly more inclined than subjects in lower pay grades to report NO requirement for information presentation with respect to the various information classifications. These findings DID tend to support the hypothesis, but not significantly.

4. Hypothesis 4 and Findings

a. Hypothesis: The need for any kind of information presentation for job-task performance will vary according to rating. For example, personnel in electronic/electrical-type ratings (e.g., FT, ET, DS) will be more likely than those in mechanical-type ratings (e.g., CM, MM, EN) to require information presentation for any of the classifications of job task information.

b. Findings: Subjects in electronic/electrical-type ratings (FT, DS, ET, EM, IC, AE, AT) were less inclined than subjects in the mechanical-type ratings (BT, MM, AM) to report NO requirement for information presentation with respect to the various information classifications. Although electronic ratings (DS, ET, AT) were much less inclined to report no requirement than electrical ratings (EM, IC, AE), the overall findings DID tend to support the hypothesis.

5. Hypothesis 5 and Findings

a. Hypothesis: When information presentation IS needed in order to perform job tasks, higher aptitude personnel will require fewer format alternatives (e.g., text only, as compared to test and drawings) than lower aptitude personnel for comprehension of the information presented.

b. Findings: The higher (H) GCT group was consistently greater than the lower (L) GCT group in the total number of format preferences indicated. The numbers of format preferences selected by the H group were significantly

greater for drawings and diagrams, and slightly greater for text and tables. These findings did NOT support the hypothesis.

6. Hypothesis 6 and Findings

a. Hypothesis: When information presentation IS needed in order to perform job tasks, personnel with higher civilian education will require fewer format alternatives (e.g., text only, as compared with text and drawings) than personnel with lower civilian education for comprehension of the information presented.

b. Findings: A higher fraction of "H.S. +" group tended to indicate a preference for photograph and drawing formats than the "H.S. only" group, and significantly higher preferences for various types of drawings, diagrams, and tables. These findings did NOT support the hypothesis.

7. Hypothesis 7 and Findings

a. Hypothesis: When information presentation IS needed in order to perform job tasks, personnel in higher pay grades will require fewer format alternatives (e.g., text only, as compared with text and drawings) than personnel in lower pay grades for comprehension of the information presented.

b. Findings: The number of format preferences reported tended to increase with each higher pay grade for most of the information classifications. The expressed numbers of preferences were substantially greater for text and tables, with each higher pay grade. These findings did NOT support the hypothesis.

8. Hypothesis 8 and Findings

a. Hypothesis: When information presentation IS needed in order to perform job tasks, personnel in electronic/electrical-type ratings will require more format alternatives (e.g., text and drawings, as compared with text only drawings) than personnel in mechanical-type ratings for comprehension of the information presented.

b. Findings: Subjects in electronic/electrical type ratings (FT, DS, ET, EM, IC, AE, AT) were more inclined than subjects in mechanical-type ratings (BT, MM, AM) to report extensive format requirements, and especially preferences for a large variety of drawings and diagrams. These findings DID support the hypothesis.

9. Hypothesis 9 and Findings

a. Hypothesis: The need for any kind of information presentation for job-task performance will vary according to information classification. Requirements for information presentation will increase with each higher information classification, from Basic to Configurative.

b. Findings: With little variation, the number of subjects indicating NO requirement for information presentation decreased with each higher information classification. These findings DID support the hypothesis.

10. Hypothesis 10 and Findings

a. Hypothesis: The kinds of formats required for job task performance will vary according to information classification. Each information classification, from Basic to Configurative, will have its own unique information presentation characteristics.

b. Findings: A great deal of variation was found in the number and kind of format preferences, as a function of information classification. See summary of results in Section III C. These findings DID support the hypothesis.

11. Hypothesis 11 and Findings

a. Hypothesis: The kinds of formats required for information presentation for job-task performance will vary according to aptitude. Higher-aptitude personnel will be less likely than lower-aptitude personnel to depend upon "concrete" formats (e.g., photographs), as opposed to "abstract" formats (e.g., text), for comprehension of technical information.

b. Findings: Significantly more H-group than L-group subjects reported preferences for "concrete" formats (i.e., for drawings and diagrams); while only slightly more H group than L group subjects reported preferences for "abstract" formats (i.e., for text and tables). These findings did NOT support the hypothesis.

12. Hypothesis 12 and Findings

a. Hypothesis: The kinds of formats required for information presentation for job-task performance will vary according to civilian education level. Personnel with higher education will be less likely than those with lower education to depend upon "concrete" formats (e.g., photographs), as opposed to "abstract" formats (e.g., text), for comprehension of technical information.

b. Findings: The "H.S. +" group tended to report a higher preference than the "H.S. only" group for photo and drawing formats, and a significantly higher preference for various types of drawings and diagrams. (Photos, drawings, and diagrams were the most "concrete" of the seven survey formats.) These findings did NOT support the hypothesis.

13. Hypothesis 13 and Findings

a. Hypothesis: The kinds of formats required for information presentation for job task performance will vary according to pay grade level.

Personnel in higher pay grades will be less likely than those in lower pay grades to depend upon "concrete" formats (e.g., photographs), as opposed to "abstract" formats (e.g., text), for comprehension of technical information.

b. Findings: The fractions of personnel expressing a preference for drawings and diagrams ("concrete" formats) increased substantially with each higher pay grade level, while only slight increases in preference were reported for text and tables ("abstract" formats). These findings did NOT support the hypothesis.

C. Interpretation of Survey Findings

Of the thirteen hypotheses proposed regarding format selection for various information classifications as determined by personnel characteristics, only five were supported by the survey findings. In contrast to eight of the hypotheses, the study indicates that personnel with the greatest aptitudes, education, and seniority appear to prefer having a variety of format configurations at their disposal, and in particular "concrete" ones like photographs, drawings, and diagrams, when performing technical job tasks. A possible explanation for this tendency is that personnel with higher mental ability and greater professional experience are more keenly aware than other personnel of the critical importance of possessing extensive technical documentation, whether or not any one technician actually will require it. Furthermore, the fewer format-type preferences indicated by subjects with lower aptitudes, education, and seniority may be evidence that: (1) personnel with lower mental ability have little confidence in the usefulness and comprehensibility of printed technical information presently found in technical manuals; and (2) inexperienced personnel are not really capable of accurately forecasting their own technical documentation requirements.

The findings of this report, however, support the fundamental assumption which has guided the overall study (Parts I to IV) thus far: that the kinds of presentation modes required to communicate technical information vary according to the nature of technical information and the characteristics of technical information users. As the findings show, preferences for presentation modes did, in fact, vary in most cases according to classifications of job task information and personnel characteristics -- although not always in the predicted way. Nevertheless, the fundamental assumption of this research was actually supported by the findings.

This report has presented a great deal of useful information about interrelationships among specific format options, particular characteristics of Navy technicians, and classifications of technical information. The fact that eight of the thirteen hypotheses were not supported by the findings reported in Section III does not affect the ultimate objective of creating a decision process for selecting presentation modes according to classifications of job task information and personnel characteristics. The hypotheses themselves must be subjected to more rigorous tests of validity than simply <u>preference</u> for particular formats, and the critical issue of format <u>comprehensibility</u>, rather than format <u>preference</u>, still has to be dealt with in Part V of this study.

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APPENDIX A

KNOWLEDGE/SKILL ELEMENTS IN PERFORMING JOB TASKS

1. Theory and/or principles of operation of equipment/hardware and/or its components.
2. How components and component parts relate to entire equipment/hardware system.
3. How components and component parts function.
4. Various formulas, rules, principles, etc.
5. Names of components and/or component parts in equipment/hardware.
6. Names of basic hand tools.
7. Names of special hand tools.
8. Names of basic testing equipment.
9. Names of special testing equipment.
10. How to use basic hand tools.
11. How to use special hand tools.
12. How to use basic testing equipment.
13. How to use special testing equipment.
14. How to read visual aids (e.g., diagrams, schematics, etc.)
15. How to read symbols.
16. How to read text materials.
17. Assembly/disassembly procedures.
18. Basic troubleshooting procedures.
19. Special troubleshooting procedures (e.g., isolating trouble through a fault logic chart).
20. Basic test equipment procedures.

21. Special test equipment procedures.

22. Basic maintenance procedures.

23. Special maintenance procedures.

24. Basic safety rules.

25. Special safety precautions, warnings, trips, etc.

26. Visual Information: e.g., flows, patterns, interconnection of component parts and components, etc. (usually shown on a schematic, diagram, blueprint, sketch, etc.)

27. Specific calibrations, settings, clearance, voltages, etc. for tools, testing equipment, and/or component parts.

28. The meaning of symbols in schematics, drawings, diagrams, prints, etc.

29. Special terminology and vocabulary associated with your rating (technical jargon, acronyms, etc.)

30. Research and reference skills.

31. Ability to differentiate between component parts and components.

32. Skills in how to operate equipment/hardware.

APPENDIX B

Technical Information Classification Descriptions

Information Classification (IC) Code	Description
IC-1	Nomenclature, terms, codes, and jargon in one's occupational specialty.
IC-2	Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/ hardware.
IC-3	Fundamental facts, basic names, and locations of components and component parts of equipment/ hardware.
IC-4	The meaning of technical symbols, acronyms and abstract terms.
IC-5	The functions of components and component parts of equipment/hardware.
IC-6	How components and component parts relate to the entire equipment/hardware system.
IC-7	Theory and principles of operation of equipment/ hardware, its components, or component parts.
IC-8	How to use hand tools and testing equipment in maintaining equipment/hardware.
IC-9	Basic safety rules or special safety precautions for working on equipment/hardware.
IC-10	Procedures: that is, procedures for assembling/ disassembling, troubleshooting, testing, maintenance, etc. of equipment/hardware.
IC-11	Calibrations, settings, torques, clearances, etc.
IC-12	Visual representations of the operational processes of complex circuitry (e.g., electrical/ electronic circuit arrangements; hydraulic/ pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.)

APPENDIX C

Navy Ratings and Occupation Groups

Rating Abbreviation	Rating Description
Group I - Deck	
BM	Boatswain's Mate
MA	Master-At-Arms
QM	Quartermaster
SM	Signalman
OS	Operations Specialist
EW	Electronic Warfare Technician
ST	Sonar Technician
STG	Sonar Technician (Surface)
STS	Sonar Technician (Submarine)
OT	Oceanographic Technician
Group II - Ordnance	
TM	Torpedoman's Mate
GM	Gunner's Mate
GMM	Gunner's Mate Missiles
GMT	Gunner's Mate Technician
GMG	Gunner's Mate Guns
FT	Fire Control Technician
FTG	Fire Control Technician Guns
FTM	Fire Control Technician Surface Missile
FTB	Fire Control Technician Ballistic Missile
MT	Guided Missileman
MN	Mineman
Group III - Electronics	
ET	Electronic Technician
ETN	Electronic Technician Communications
ETR	Electronic Technician Radar
DS	Data Systems Technician
Group IV - Precision Equipment	
PI	Precision Instrumentman
IM	Instrumentman
OM	Opticalman

Rating Abbreviation	Rating Description
Group V - Administrative and Clerical	
NC	Navy Counselor
RM	Radioman
CTT	Cryptologic Technician (Technical Branch)
CTA	Cryptologic Technician (Administrative Branch)
CTM	Cryptologic Technician (Maintenance Branch)
CTO	Cryptologic Technician (Communications Branch)
CTR	Cryptologic Technician (Collection Branch)
CTI	Cryptologic Technician (Interpretive Branch)
YN	Yeoman
LN	Legalman
PN	Personnelman
DP	Data Processing Technician
SK	Storekeeper
DK	Disbursing Clerk
CS	Commissaryman
SD	Steward
SH	Ship's Serviceman
JO	Journalist
PC	Postal Clerk
Group VI - Miscellaneous	
LI	Lithographer
DM	Illustrator Draftsman
MU	Musician
Group VII - Engineering & Hull	
MM	Machinist's Mate
EN	Engineman
MR	Machinery Repairman
BT	Boiler Technician
BR	Boilermaker
EM	Electrician's Mate
IC	Interior Communications Electrician
HT	Hull Technician
PM	Patternmaker
ML	Molder
GS	Gas Turbine System Technician
Group VIII - Construction	
CU	Constructionman
EA	Engineering Aide
CE	Construction Electrician

Rating Abbreviation	Rating Description
Group VIII - Construction (cont'd)	
EQ	Equipmentman
EO	Equipment Operator
CM	Construction Mechanic
BU	Builder
SW	Steelworker
UT	Utilities Man
Group IX - Aviation	
AF	Aircraft Maintenance Technician
AV	Avionics Technician
AD	Aviation Machinist's Mate
ADR	Aviation Machinist's Mate Reciprocating Engines
ADJ	Aviation Machinist's Mate Jet Engines
AT	Aviation Electronics Technician
AX	Aviation Antisubmarine Warfare Technician
AW	Aviation Antisubmarine Warfare Operator
AO	Aviation Ordnanceman
AQ	Aviation Fire Control Technician
AC	Air Controlman
AB	Aviation Boatswain's Mate
ABE	Aviation Boatswain's Mate Launch and Recovery
ABF	Aviation Boatswain's Mate Fuel Handling
ABH	Aviation Boatswain's Mate Aircraft Handling
AE	Aviation Electrician's Mate
AM	Aviation Structural Mechanic
AMS	Aviation Structural Mechanic - Structures
AMH	Aviation Structural Mechanic - Hydraulics
AME	Aviation Structural Mechanic - Safety Equipment
PR	Aircrew Survival Equipmentman
AG	Aerographer's Mate
TD	Training Deviceman
AK	Aviation Storekeeper
AZ	Aviation Maintenance Administrationman
AS	Aviation Support Equipment Technician
ASE	Aviation Support Equipment Technician Electrical
ASH	Aviation Support Equipment Technician Hydraulic/Structures
ASM	Aviation Support Equipment Technician Mechanical
PH	Photographer's Mate
PT	Photographic Intelligenceman

Rating Abbreviation	Rating Description
Group X - Medical	
HM	Hospital Corpsman
Group XI - Dental	
DT	Dental Technician

APPENDIX D

Descriptions of Format Types*

Format Types	Description
1. Photograph	A picture or likeness originally obtained using a light-sensitive film (definition includes copies obtained via halftone screen process).
2. Airbrushed Photograph	A photograph with details enhanced, and/or irrelevant material obliterated, by application of ink or coloring agents from a spray gun.
3. Airbrushed Drawing	A sketch or engineering drawing with details enhanced, and/or irrelevant material obliterated, by application of ink or coloring agents from a spray gun.
4. Sketch	A freehand drawing illustrating important features of an object without concern for precision of dimensions.
5. Engineering Drawing	The representation of an object by means of lines, stressing precision of dimensions.
6. Two-Dimensional View	The representation of an object in one plane, e.g., a front view without perspective/depth cues.
7. Three-Dimensional View	The representation of an object showing more than one plane with "vanishing point" perspective.
8. Assembled View	A representation showing all parts of an object fitted together as seen in normal use.
9. Exploded View	A view of an object showing the parts separated, but in correct relationship to each other.
10. Cut-Away View	A view showing exterior parts cut away to clarify the relationship and workings of inner parts.

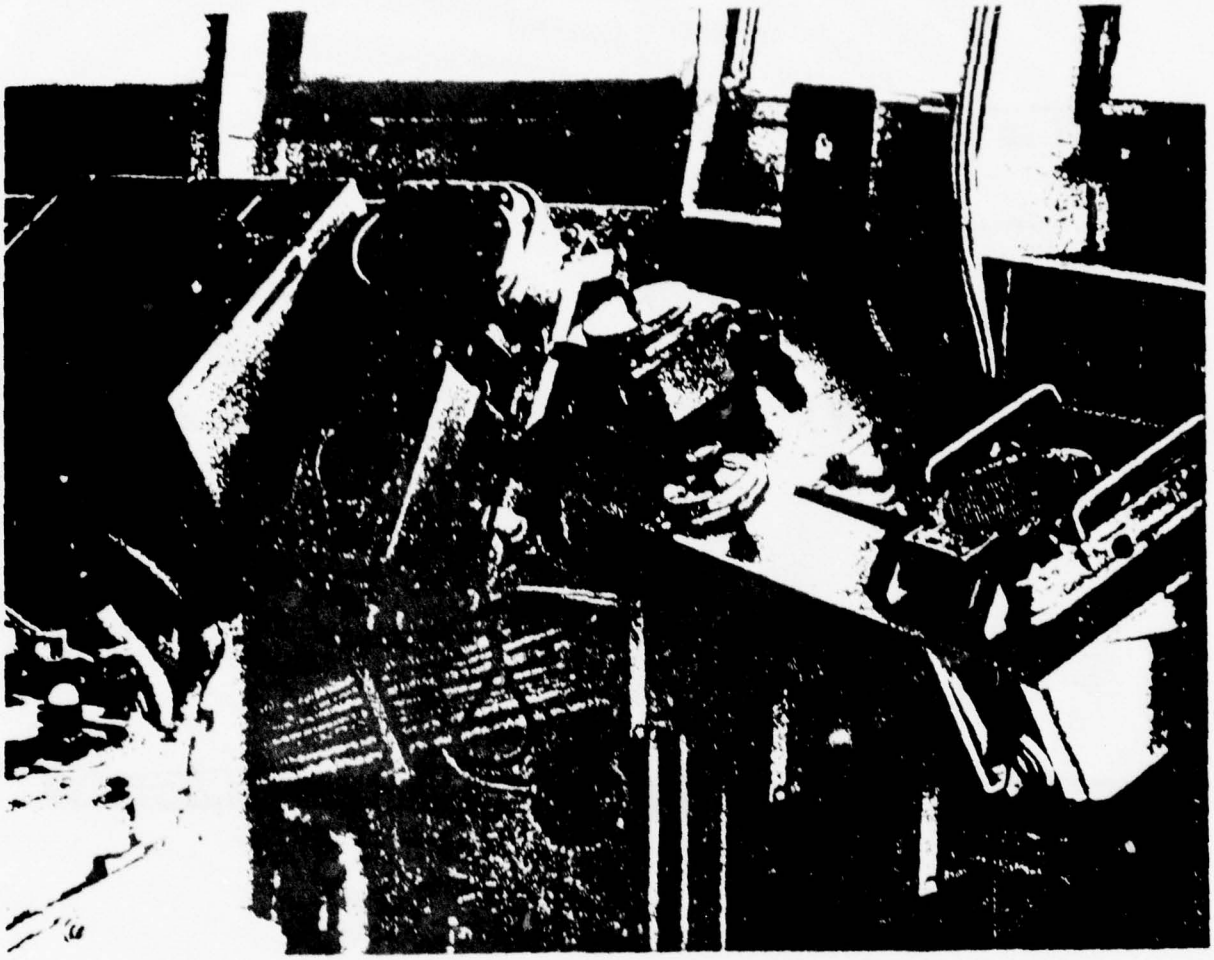
*See Appendix F for an example of each format type.

11. **Overall Block Diagram**	A diagram composed of rectangular blocks connected by lines representing a physical and/or functional interface between components of a system.
12. **Detailed Block Diagram**	A diagram similar in construction to the overall block, but describing one function or subsystem in terms of its units or components.
13. **Schematic Diagram**	A diagram showing the connections and functions of assemblies and parts via symbols to illustrate the path of energy: electrical schematics show a conceptual arrangement of a circuit and components; piping schematics show hydraulic and pneumatic flow through pumps, valves, gauges, etc.; mechanical schematics show arrangements of gears, shafts, levers, and linkages.
14. **Wiring Diagram**	A diagram identifying the physical path of all electrical power and signals in a specified level of equipment. Individual wires may be coded alphanumerically with their connection points. The actual physical locations of the wires in a chassis are not necessarily pictorially represented in a wiring diagram.
15. **Cabling Diagram**	A diagram identifying individual cables by alphanumeric code. Coded connection points between equipments and assemblies are shown. It may be schematic or pictorial; the latter shows physical location.
16. **Functional Signal Flow Diagram**	A diagram showing the path of specific signals for one function. The diagram may include coded lines to aid in tracing a specific function and its basic groups of signals through a system, equipment, or assembly. It identifies point-to-point wiring; may have blocks and/or schematic symbols.

17. **Digital Logic Diagram**	A diagram symbolically representing the functional relationship of logic sections, units, and assemblies, incorporating Boolean equations, truth tables, and signal characteristics, as necessary for clarity.
18. **Blocked Schematic Diagram**	An electrical, mechanical, or piping schematic diagram superimposed on a block diagram to show physical relationships and functional interfaces simultaneously.
19. **Blocked Digital Logic Diagram**	Digital logic symbology superimposed on block diagrams to represent two levels of complexity simultaneously.
20. **Pictorial Block Diagram**	A block diagram incorporating pictorial representation of equipment or assemblies instead of simple rectangles.
21. **Timing Diagram**	A diagram showing the relationships among a group of timing signals (conventional and digital) by their alignment against a common origin on a graphic time scale.
22. **Maintenance Dependency Chart (MDC)**	A diagram specially constructed for fault isolation at system, equipment, and assembly levels such that the last <u>good</u> indication and the first <u>bad</u> indication in the dependency structure can be established, thereby leading to the location of the faulty element in the dependency structure. The dependency structure is the interrelationship of all the inputs and outputs of each function.
23. **Decision Tree**	A diagram incorporating symbols for actions and indications as part of a forced sequence of actions to be followed when operating or troubleshooting equipment. Each indication has a binary output (yes - no; good - bad; etc.) forcing the choice of the next appropriate indication or action.
24. **Waveform**	A graphical representation of the shape of an electrical wave that indicates the characteristics of frequency and amplitude on a scale.

25.	**Graph**	A diagram that illustrates a set of data plotted against one or more scales. The diagram expresses the relationship between two variables.
26.	**Directive Text**	A writing style in which sentences start with the imperative form of a verb, so the reader is commanded to perform an action.
27.	**Deductive Text**	A writing style in which facts relating to the operation or maintenance of equipment are presented as premises requiring the reader to bridge the gap between supplied information and unstated conclusions.
28.	**Continuous Text**	Text written in a normal prose style; a smooth narrative divided appropriately into paragraphs.
29.	**Segmented Text**	Text written as a series of short statements in which the theme in each statement does not necessarily relate to that in the following statement.
30.	**Retrieval-Oriented List**	A list provided to aid the reader in locating information in the document, e.g., tables of contents, lists of illustrations, and indices.
31.	**Glossary/Abbreviations**	A list of definitions of unfamiliar words, abbreviations, acronyms, symbols, or other unique items.
32.	**Materials List**	A list of parts, tools, controls, displays, test equipment, or other set(s) of items used in operating or maintaining equipment.
33.	**Wire List**	A list of wiring connections for point-to-point wire checking, listing origin of signal, location of connection, and destination of output in a simple coded format.
34.	**Procedures Table**	A tabular format used to organize procedures into a logical sequence. Reference data in the table are usually organized in columnar form.

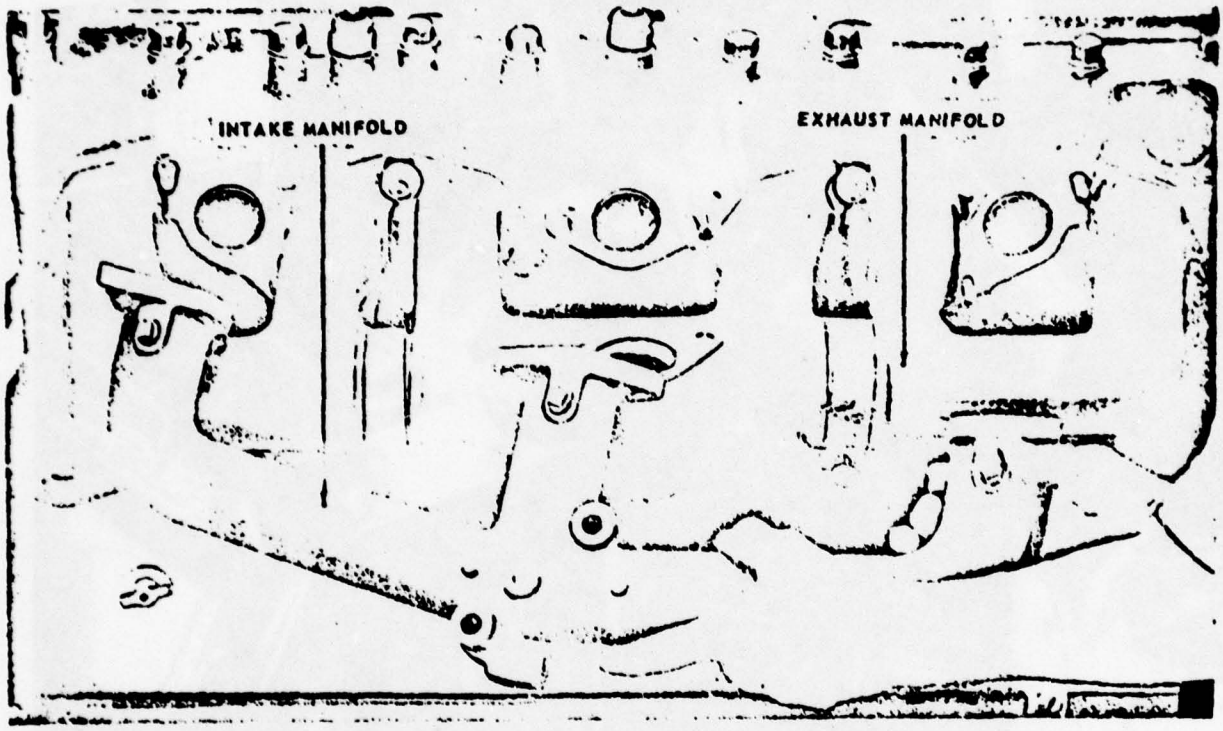
35. **Specialized Data Table**	Information condensed into a table pertaining to a specialized area of knowledge. Tabular formats have one primary axis (column or row headings) while matrices use two axes in order to locate a cell containing the desired information. As a result, cells in matrices are more likely to contain numbers and symbols, while cells in tables are more likely to contain words.
36. **Specialized Data Matrix**	Information condensed into a matrix pertaining to a specialized area of knowledge. Tabular formats have one primary axis (column or row headings) while matrices use two axes in order to locate a cell containing the desired information. As a result, cells in matrices are more likely to contain numbers and symbols, while cells in tables are more likely to contain words.
37. **Retrieval-Oriented Matrix**	A matrix provided to aid the reader in locating information in the document. Information on two axes is used to locate cells containing page, paragraph, or section numbers.



1. PHOTOGRAPH

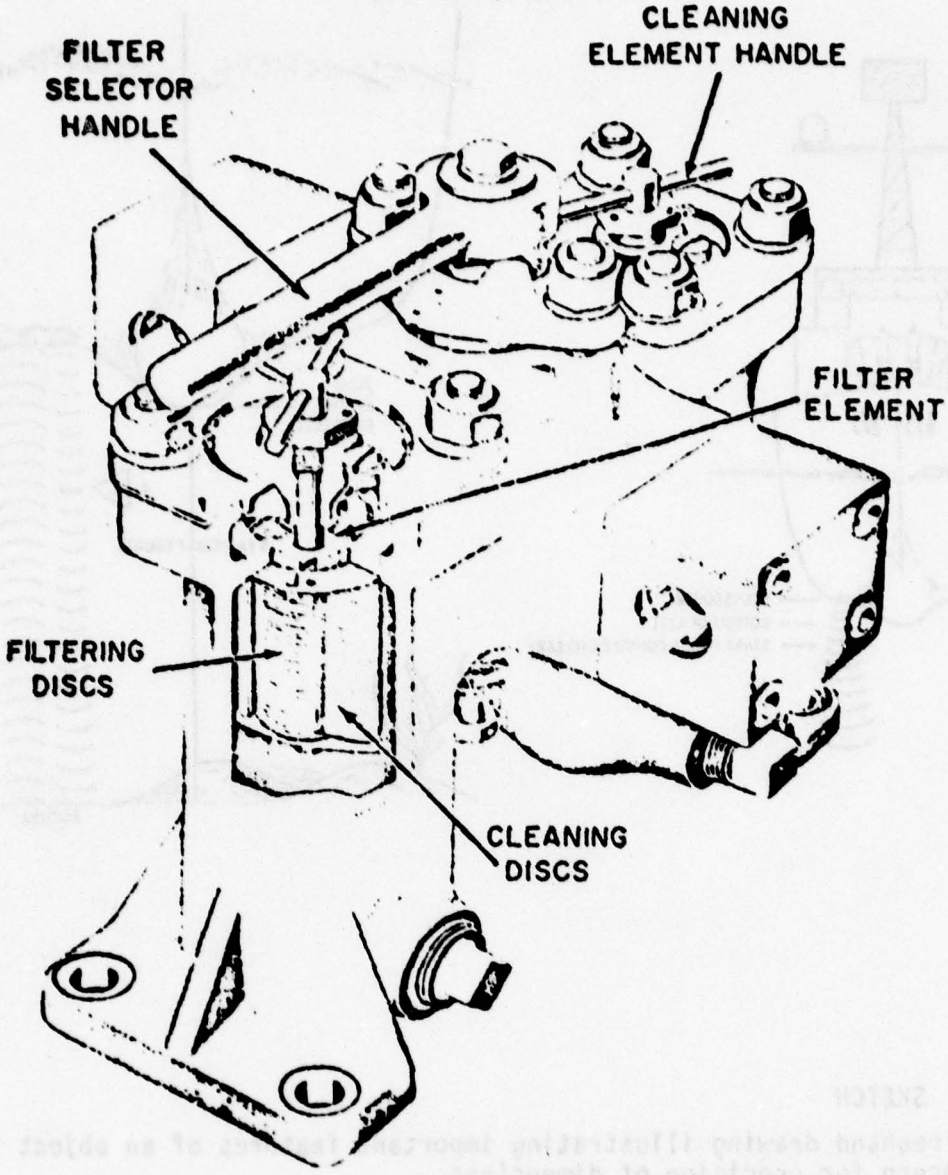
A picture or likeness originally obtained using a light-sensitive film (definition includes copies obtained via halftone screen process).

Note: The thirty-seven examples of Appendix F are taken from: Anacapa Sciences, Inc., User-Data Match Final Report Concept, Development, and Description of the Model. Santa Barbara, California, May 1977; and Hughes Aircraft Company, Ground Systems Group, Systems and Feasibility Tradeoff Analyses, Task 3 Report [CDRL A003] Preliminary NTIP System Concept and Alternative Configurations. Review Draft. Fullerton, California, 30 April 1977.



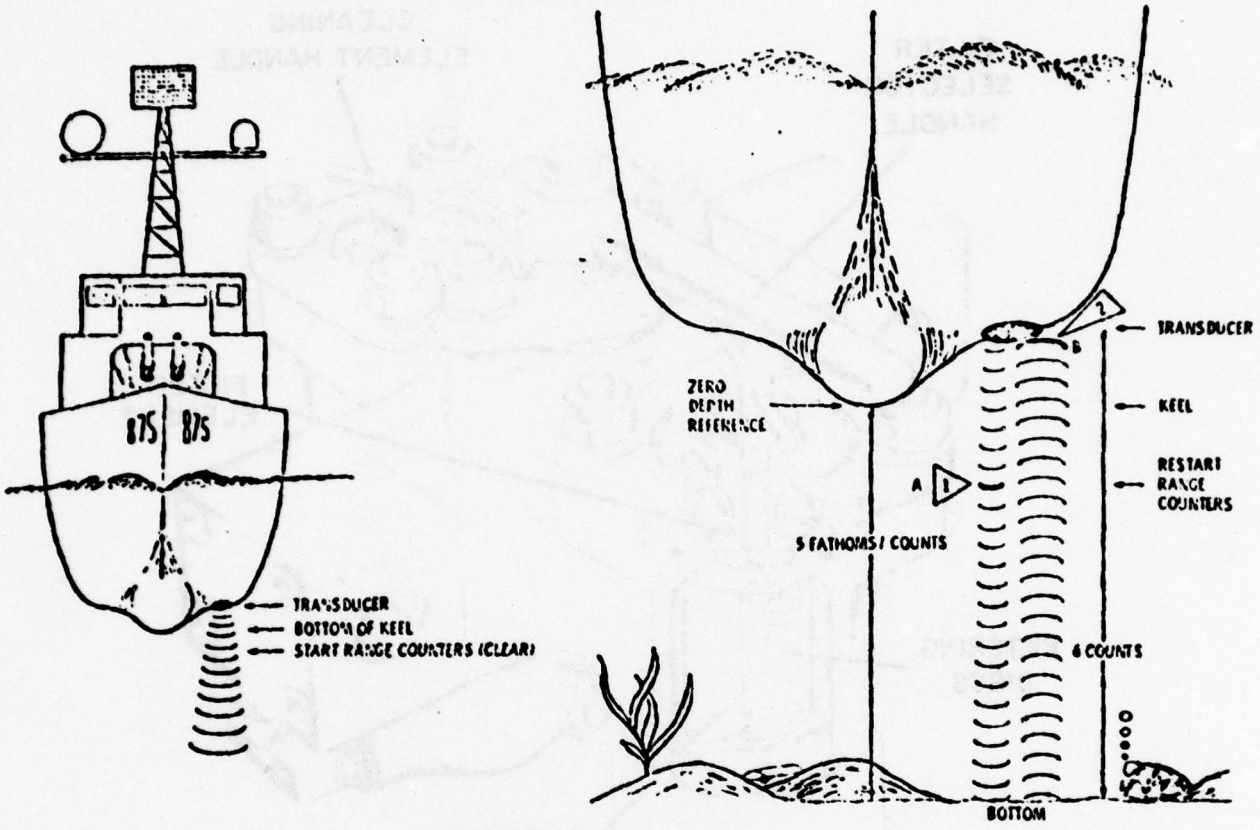
2. AIRBRUSHED PHOTOGRAPH

A photograph with details enhanced, and/or irrelevant material obliterated, by application of ink or coloring agents from a spray gun.



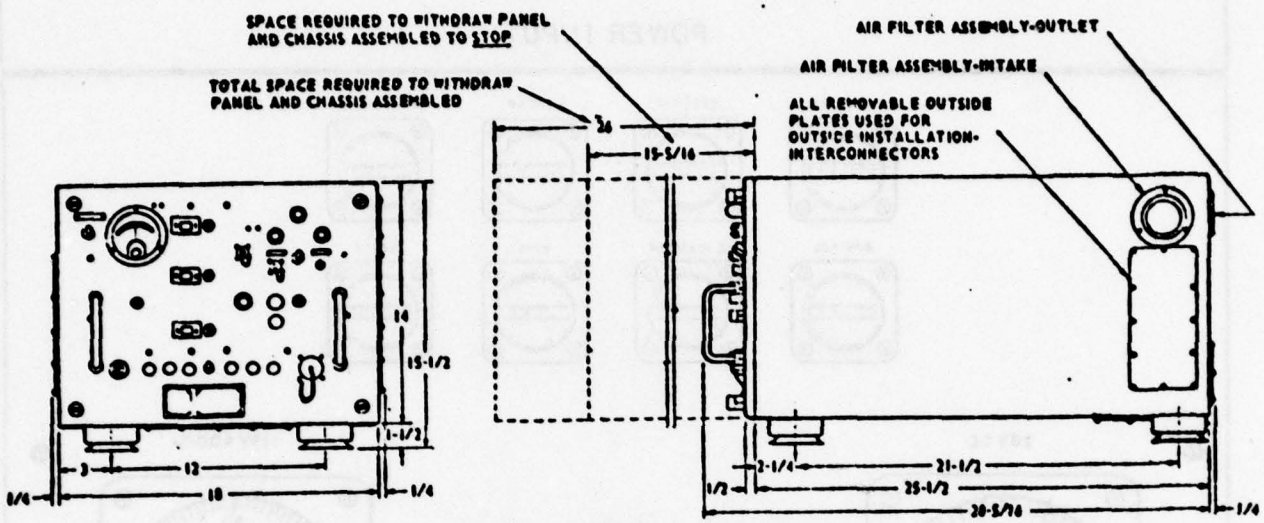
3. AIRBRUSHED DRAWING

A sketch or engineering drawing with details enhanced, and/or irrelevant material obliterated, by application of ink or coloring agents from a spray gun.



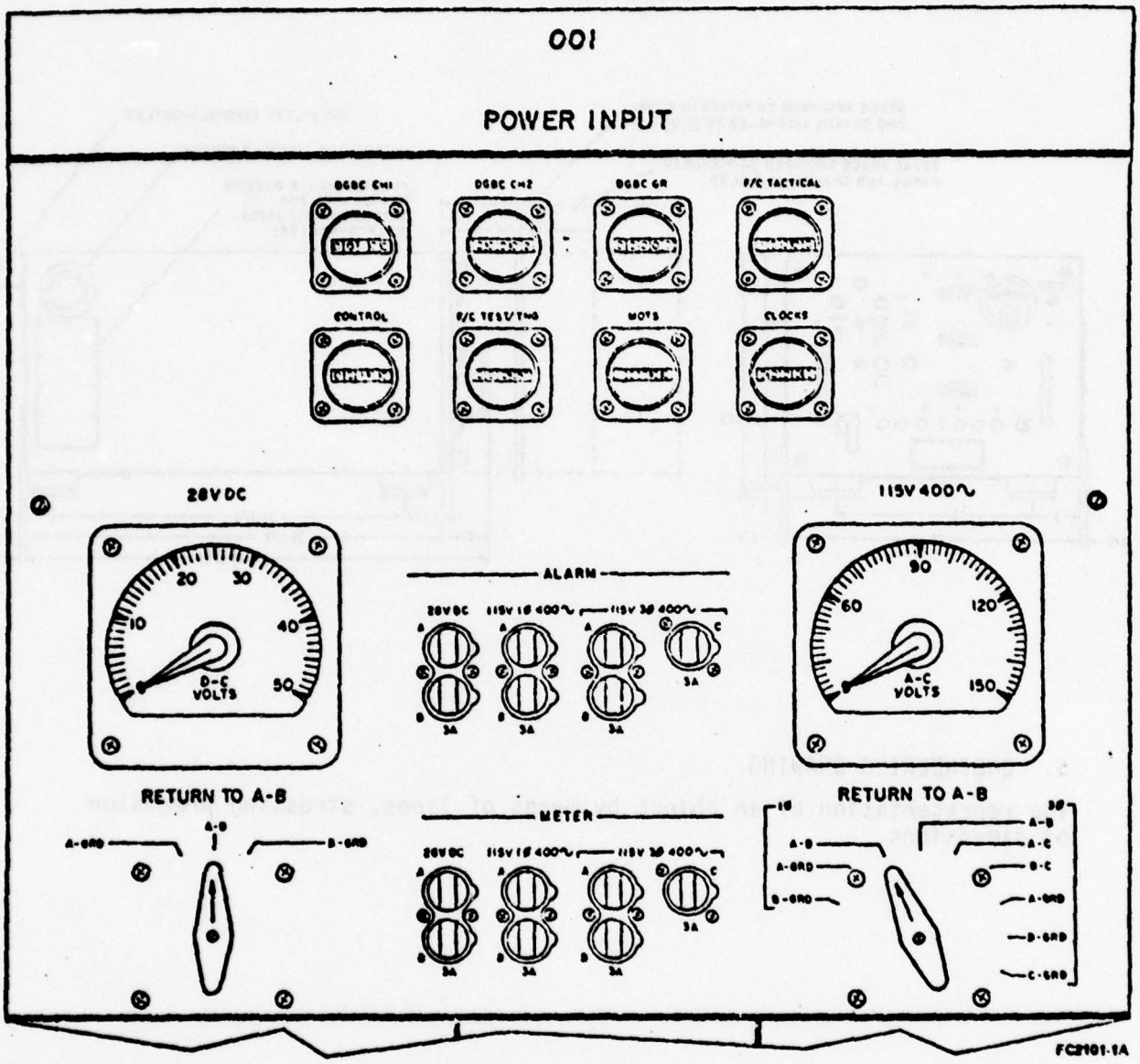
4. SKETCH

A freehand drawing illustrating important features of an object without concern for precision of dimensions.



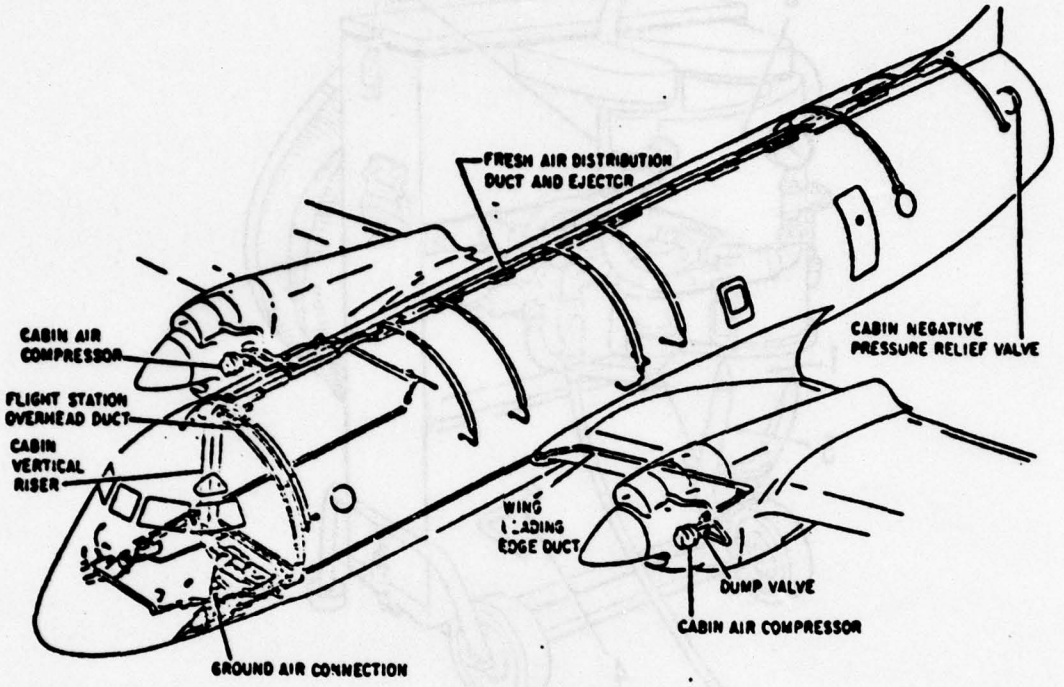
5. ENGINEERING DRAWING

The representation of an object by means of lines, stressing precision of dimensions.



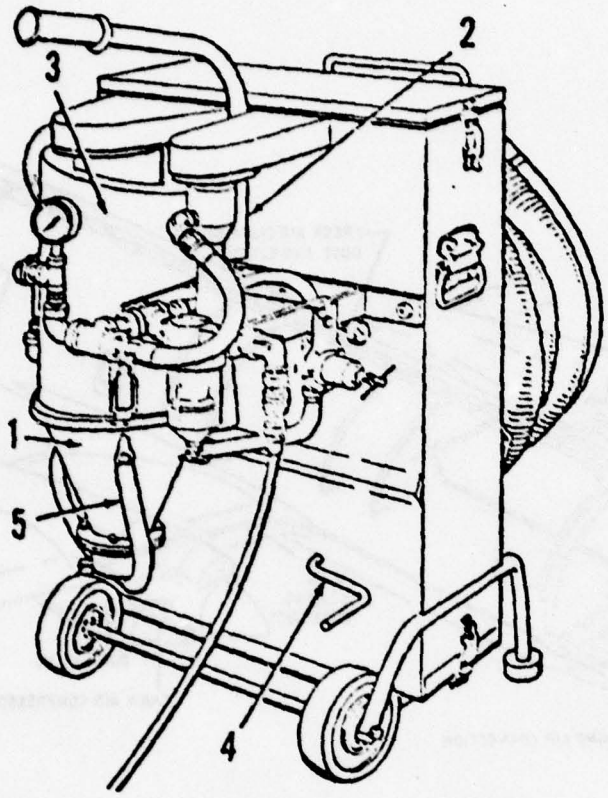
6. TWO-DIMENSIONAL VIEW

The representation of an object in one plane, e.g., a front view without perspective/depth cues.



7. THREE-DIMENSIONAL VIEW

The representation of an object showing more than one plane with "vanishing point" perspective.

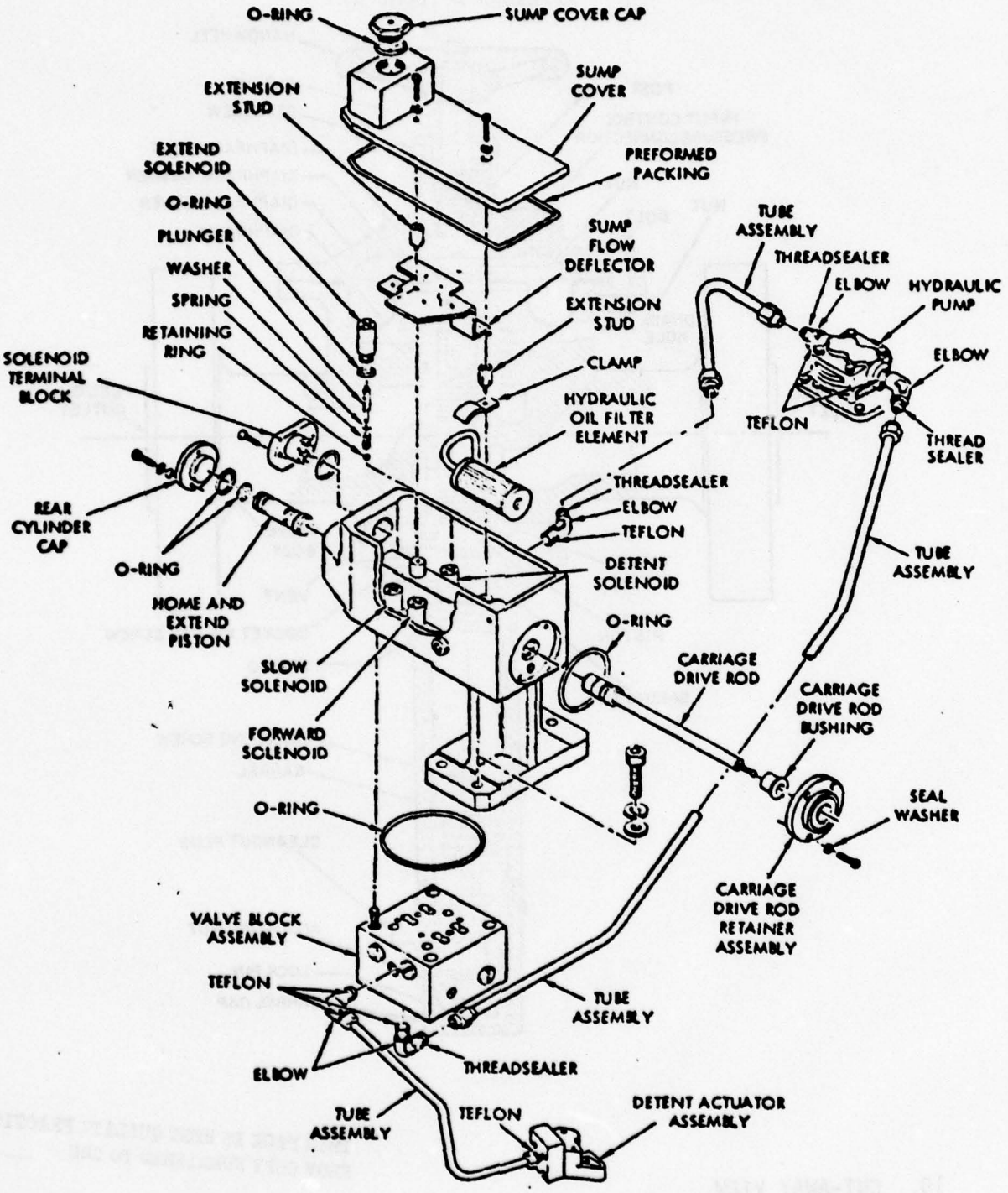


AM.912

1. Abrasive storage tank.
2. Air ejector pump.
3. Abrasive reclaimer.
4. Filter bag shaking handle.
5. Suction bypass line.

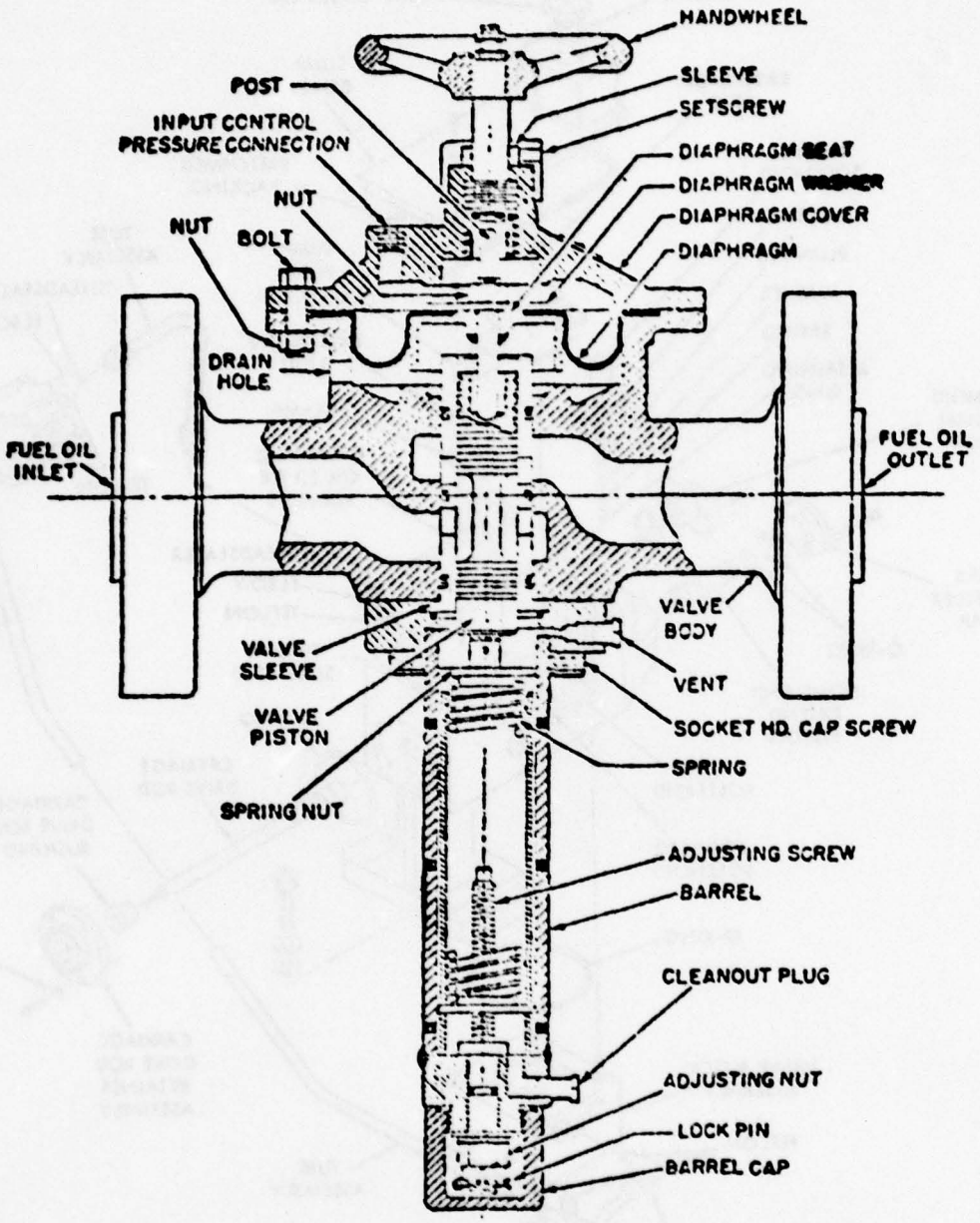
8. ASSEMBLED VIEW

A representation showing all parts of an object fitted together as seen in normal use.



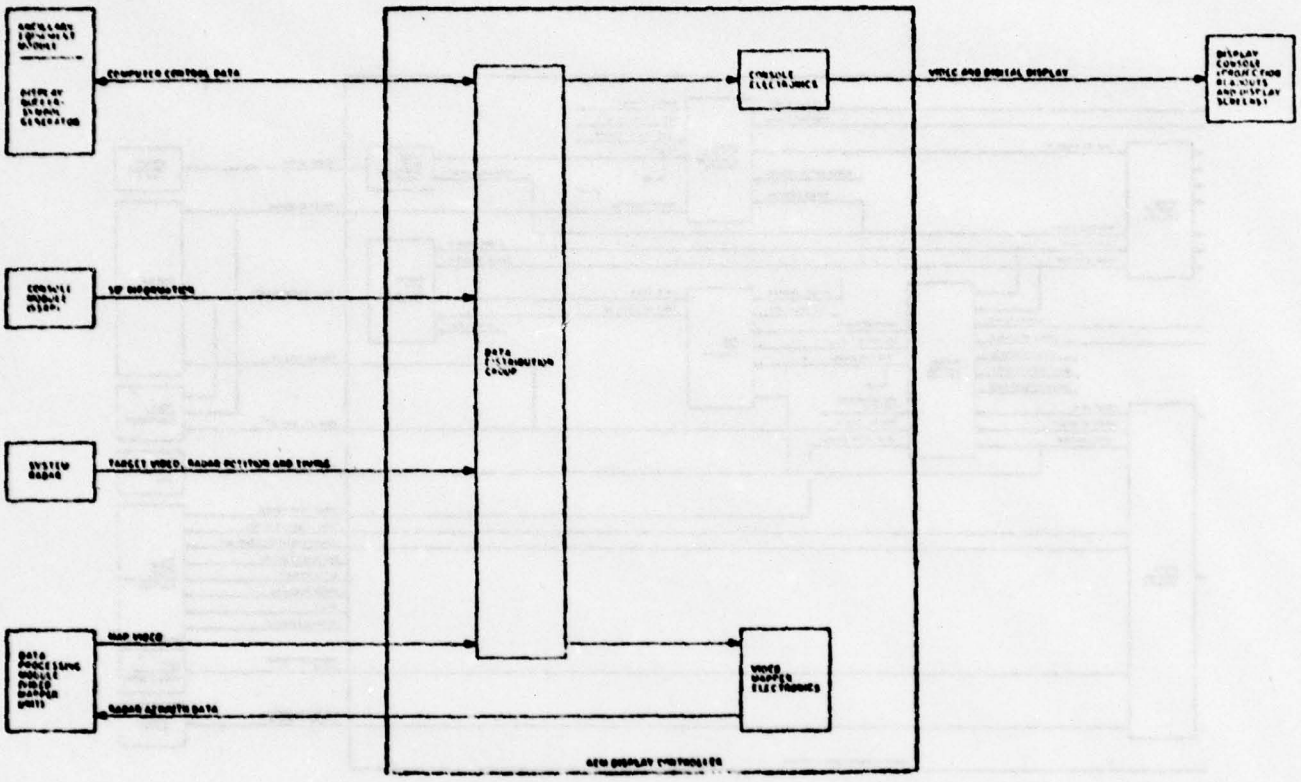
9. EXPLODED VIEW

A view of an object showing the parts separated, but in correct relationship to each other.



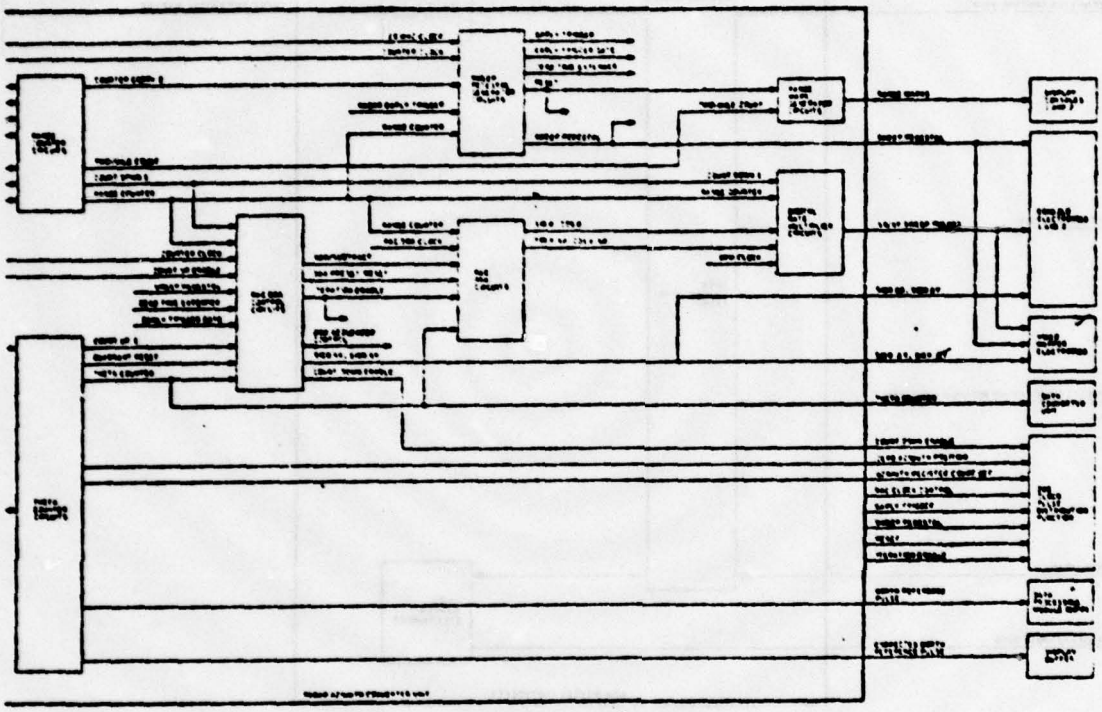
10. CUT-AWAY VIEW

A view showing exterior parts cut away to clarify the relationship and workings of inner parts.



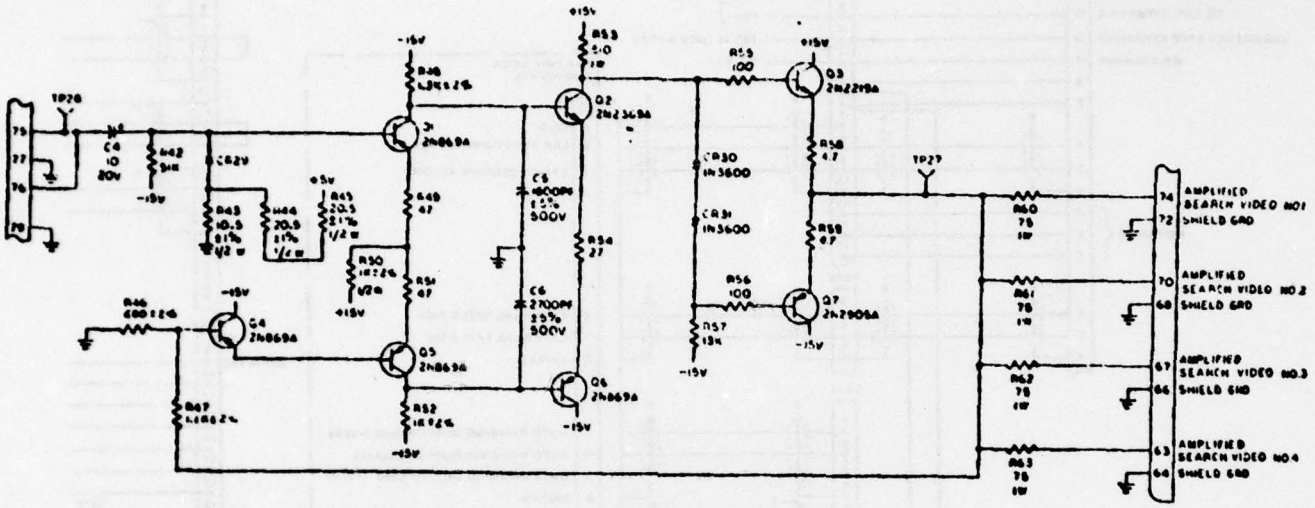
11. OVERALL BLOCK DIAGRAM

A diagram composed of rectangular blocks connected by lines representing a physical and/or functional interface between components of a system.



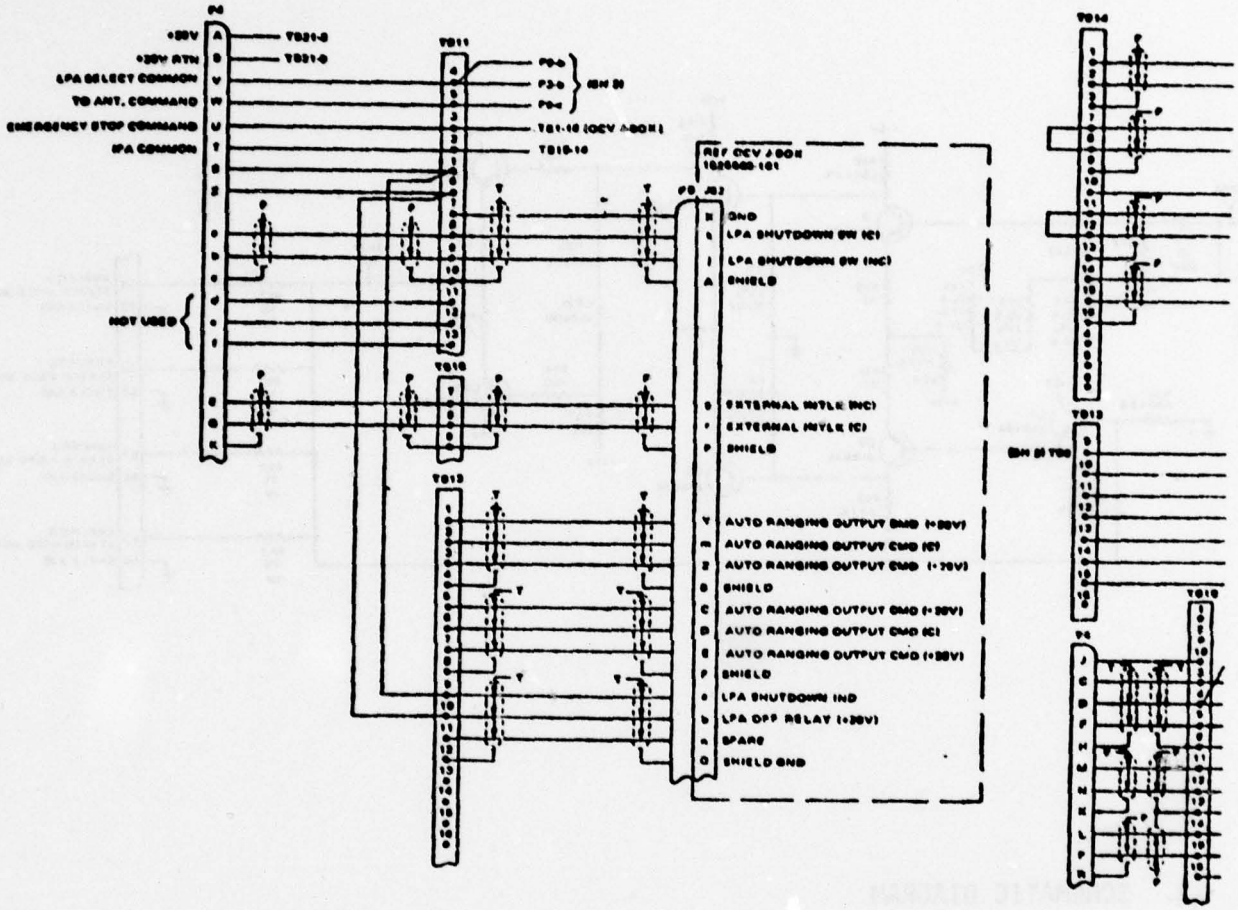
12. DETAILED BLOCK DIAGRAM

A diagram similar in construction to the overall block, but describing one function or subsystem in terms of its units or components.



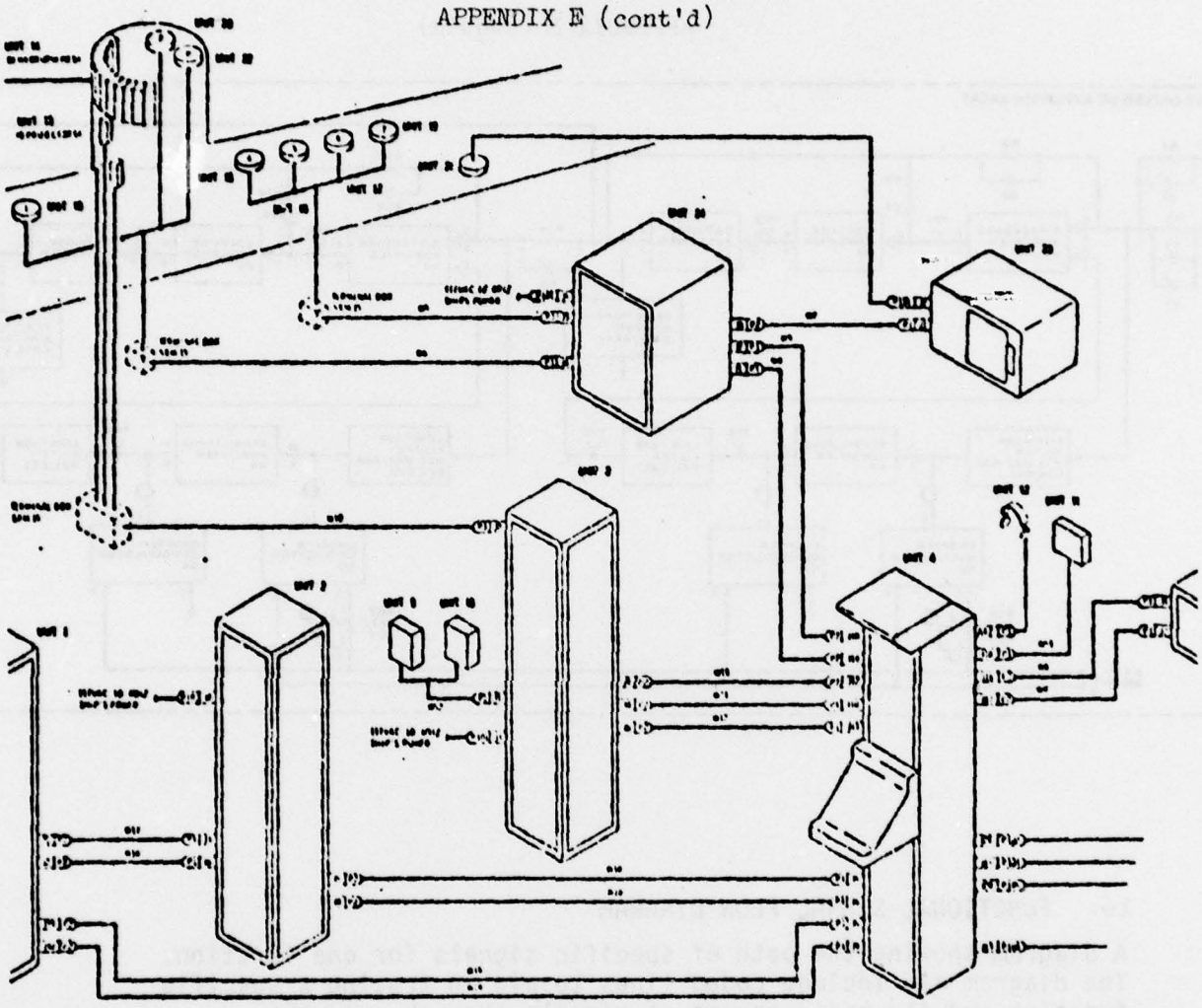
13. SCHEMATIC DIAGRAM

A diagram showing the connections and functions of assemblies and parts via symbols to illustrate the path of energy: electrical schematics show a conceptual arrangement of a circuit and components; piping schematics show hydraulic and pneumatic flow through pumps, valves, gauges, etc.; mechanical schematics show arrangements of gears, shafts, levers, and linkages.



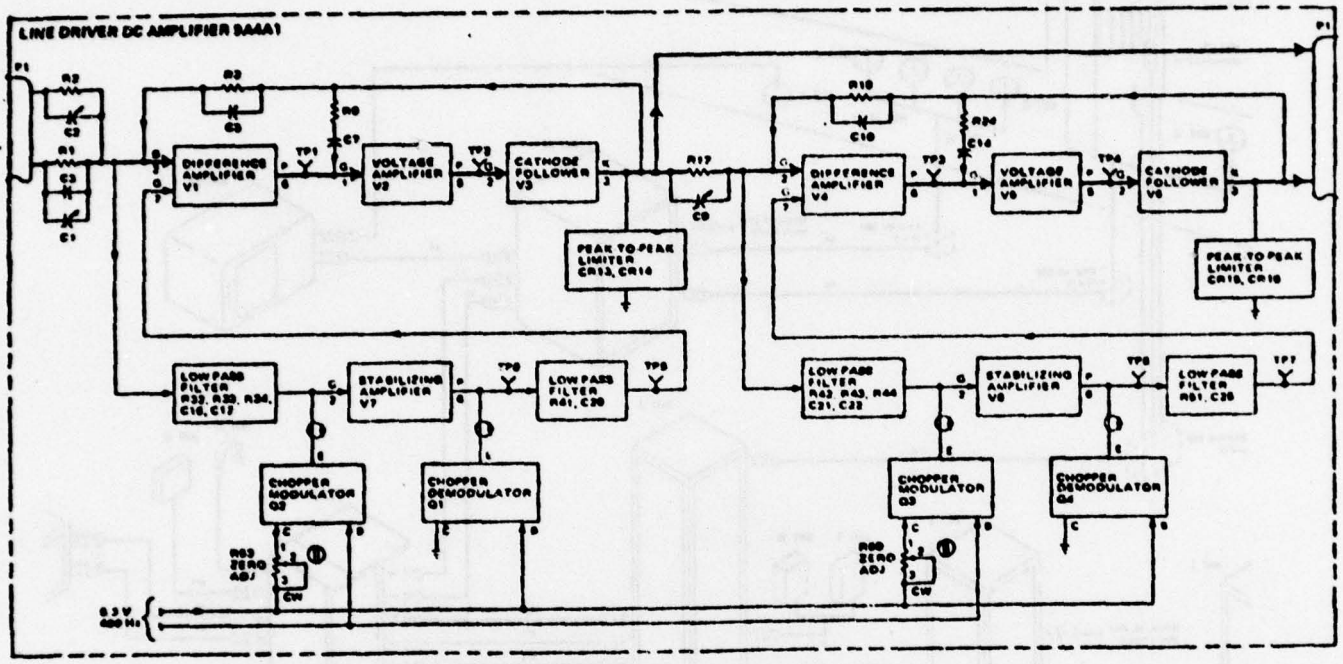
14. WIRING DIAGRAM

A diagram identifying the physical path of all electrical power and signals in a specified level of equipment. Individual wires may be coded alphanumerically with their connection points. The actual physical locations of the wires in a chassis are not necessarily pictorially represented in a wiring diagram.



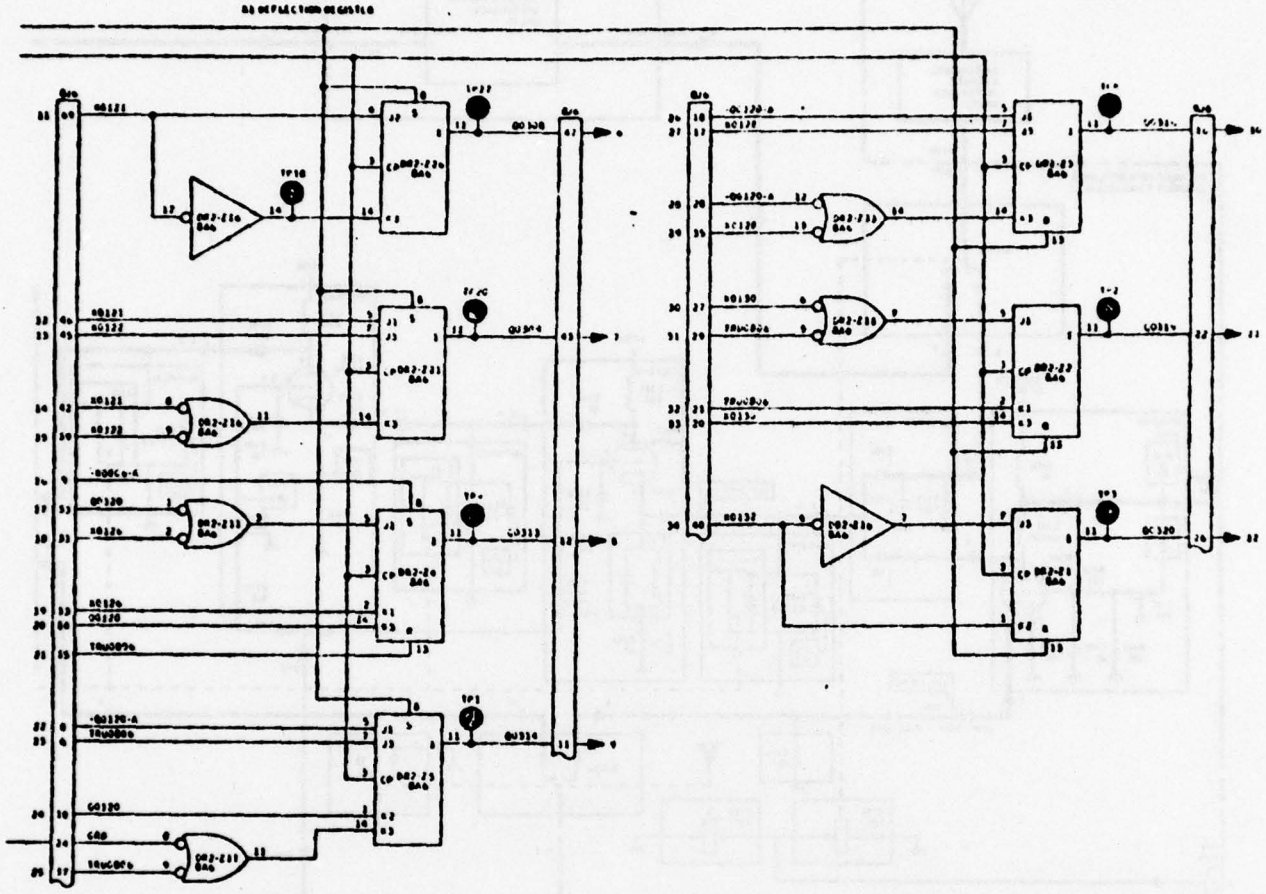
15. CABLING DIAGRAM

A diagram identifying individual cables by alphanumeric code. Coded connection points between equipments and assemblies are shown. It may be schematic or pictorial; the latter shows physical location.



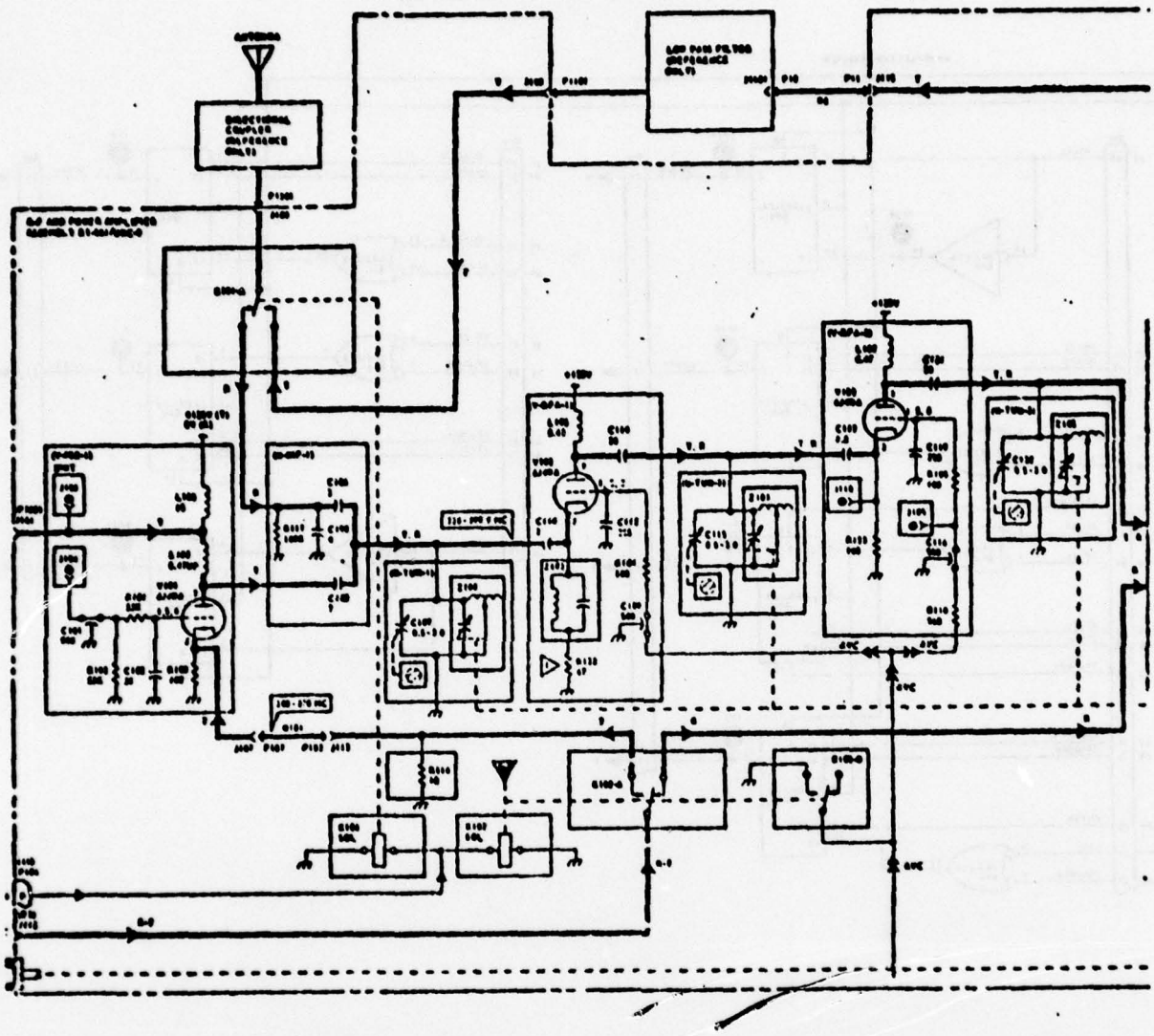
16. FUNCTIONAL SIGNAL FLOW DIAGRAM

A diagram showing the path of specific signals for one function. The diagram may include coded lines to aid in tracing a specific function and its basic groups of signals through a system, equipment, or assembly. It identifies point-to-point wiring; may have blocks and/or schematic symbols.



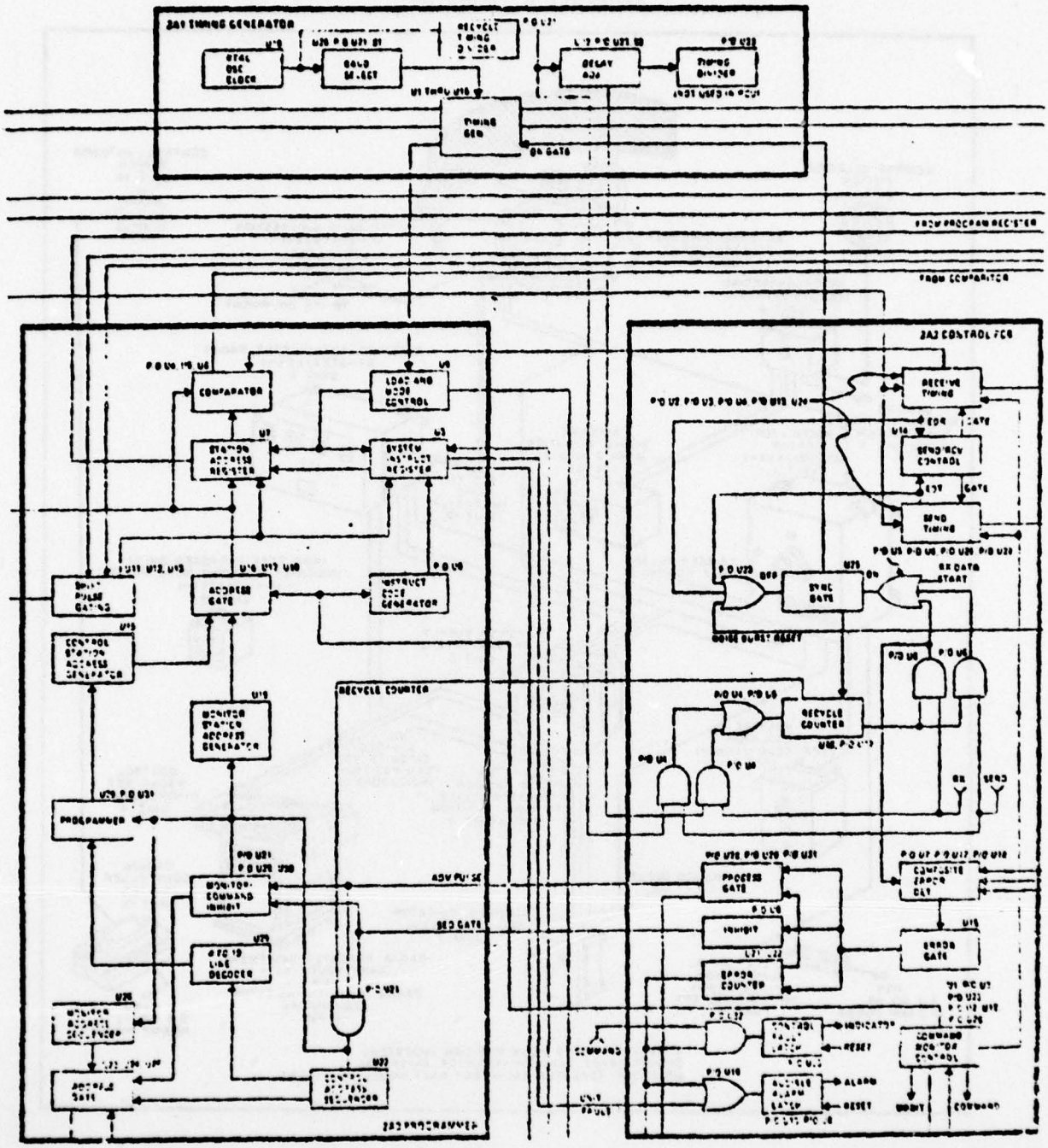
17. DIGITAL LOGIC DIAGRAM

A diagram symbolically representing the functional relationship of logic sections, units, and assemblies, incorporating Boolean equations, truth tables, and signal characteristics, as necessary for clarity.



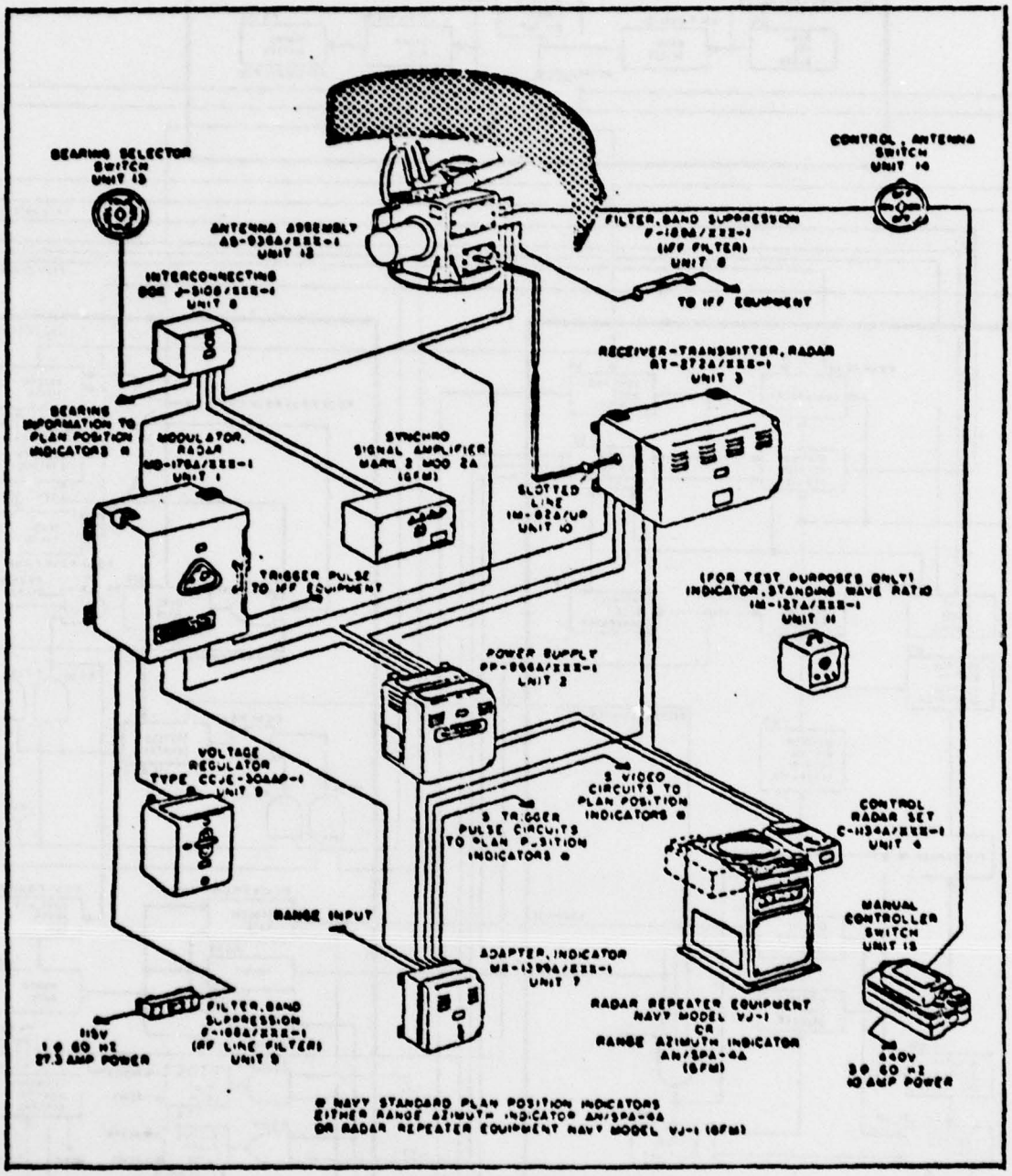
18. **BLOCKED SCHEMATIC DIAGRAM**

An electrical, mechanical, or piping schematic diagram superimposed on a block diagram to show physical relationships and functional interfaces simultaneously.



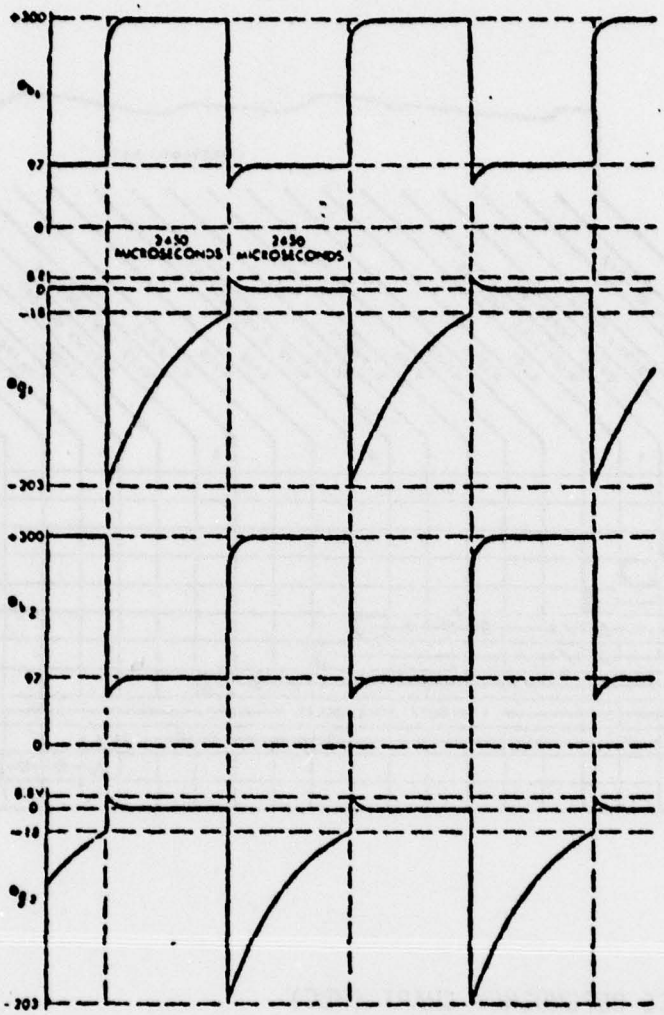
29. BLOCKED DIGITAL LOGIC DIAGRAM

Digital logic symbology superimposed on block diagrams to represent two levels of complexity simultaneously.



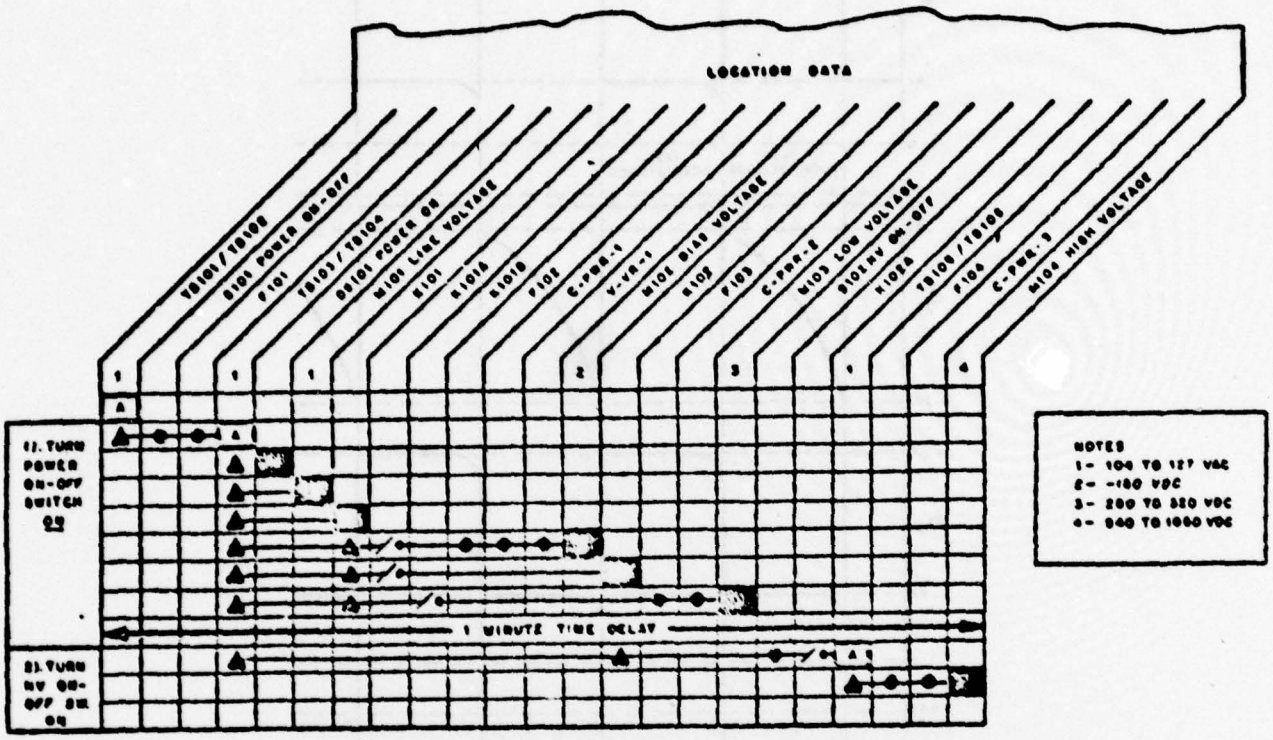
20. PICTORIAL BLOCK DIAGRAM

A block diagram incorporating pictorial representation of equipment or assemblies instead of simple rectangles.



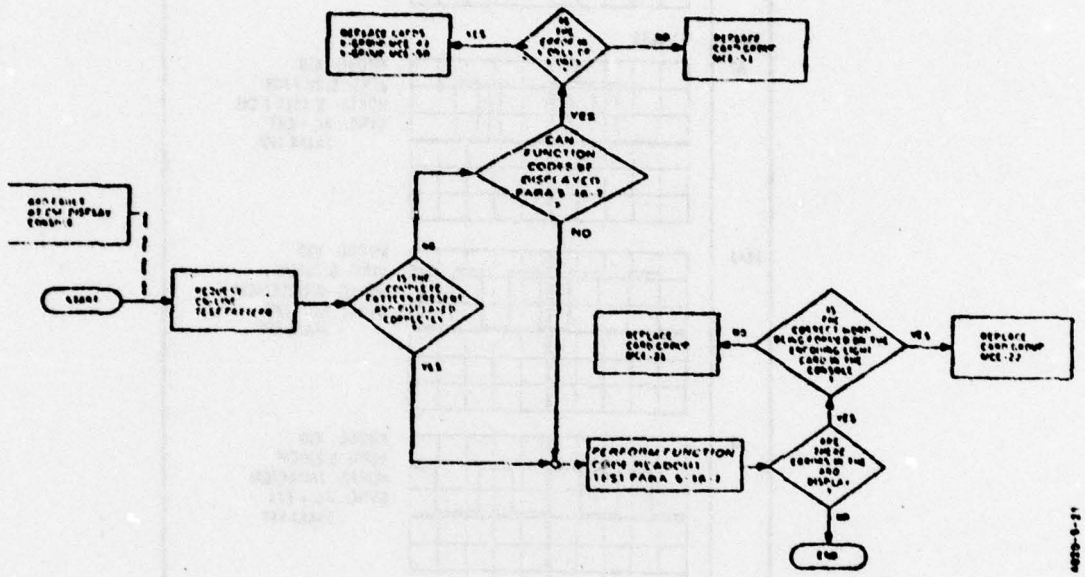
21. TIMING DIAGRAM

A diagram showing the relationships among a group of timing signals (conventional and digital) by their alignment against a common origin on a graphic time scale.



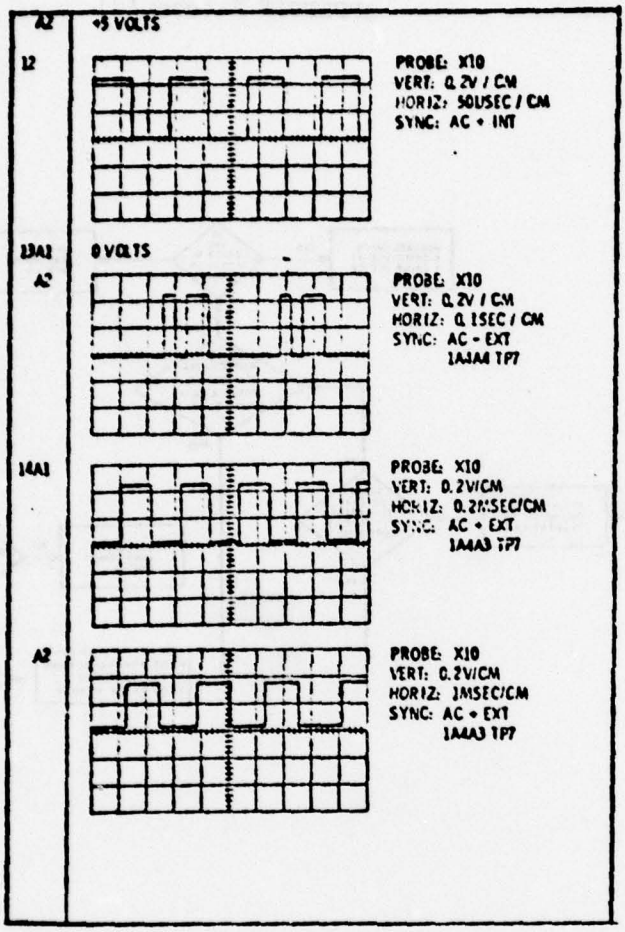
22. MAINTENANCE DEPENDENCY CHART (MDC)

A diagram specially constructed for fault isolation at system, equipment, and assembly levels such that the last *good* indication and the first *bad* indication in the dependency structure can be established, thereby leading to the location of the faulty element in the dependency structure. The dependency structure is the interrelationship of all the inputs and outputs of each function.



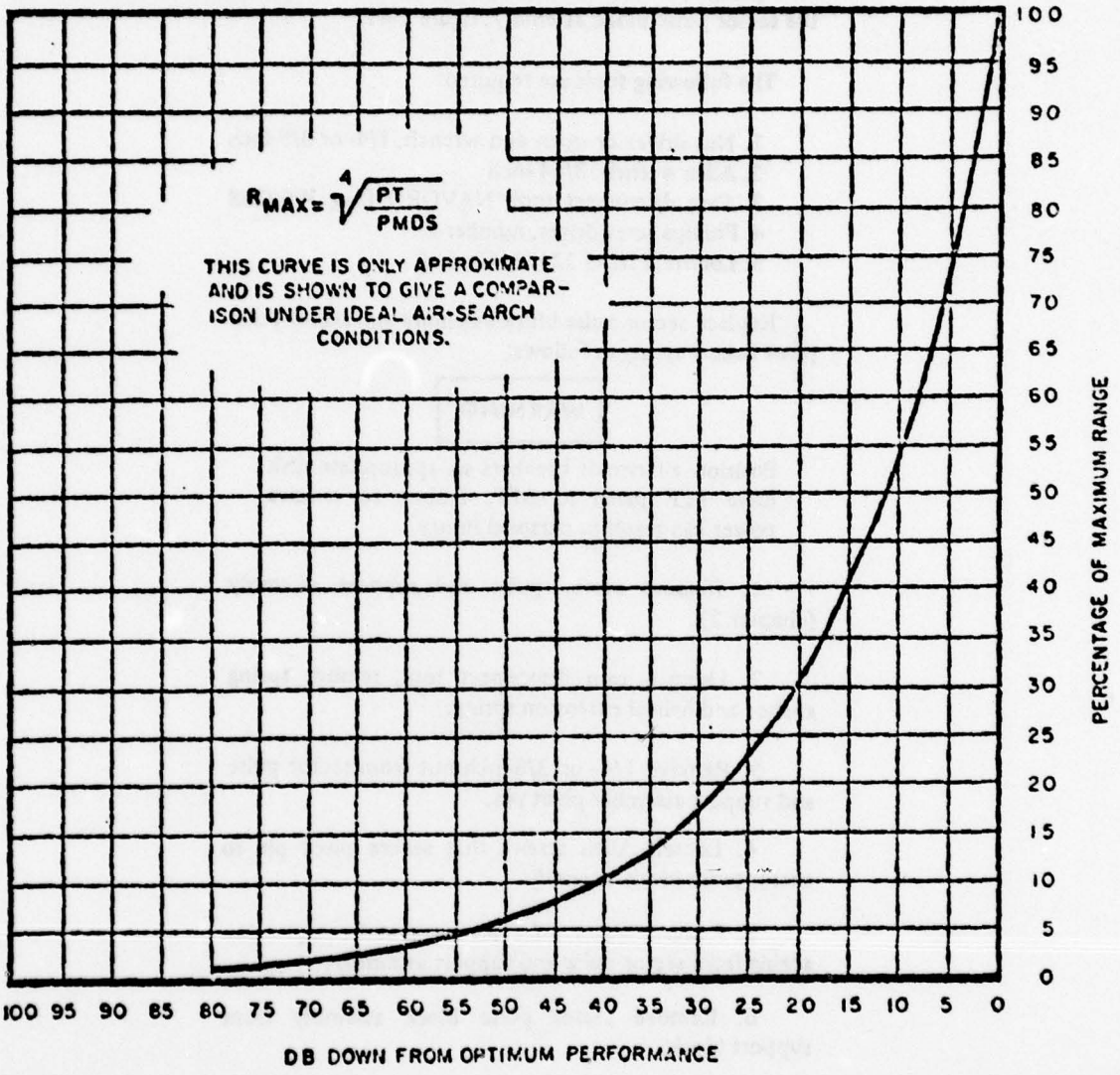
23. DECISION TREE

A diagram incorporating symbols for actions and indications as part of a forced sequence of actions to be followed when operating or troubleshooting equipment. Each indication has a binary output (yes - no; good - bad; etc.) forcing the choice of the next appropriate indication or action.



24. **WAVEFORM**

A graphical representation of the shape of an electrical wave that indicates the characteristics of frequency and amplitude on a scale.



25. **GRAPH**

A diagram that illustrates a set of data plotted against one or more scales. The diagram expresses the relationship between two variables.

2.7.8.2 Sector Pulse Block Assembly Replacement. This paragraph contains the replacement procedures for the sector pulse block assembly, figure 2-47.

The following tools are required:

1. Nut driver or open end wrench, 1/4- or 3/8-inch
2. Allen wrench, 3/64-inch
3. Cam disconnect tool, NAVORD Dwg 3902288
4. Phillips screwdriver, number 2
5. Loctite, MIL-S-22473, Grade C

Replace sector pulse block assembly and sector pulse pivot helical spring as follows:

WARNING

Position all circuit breakers on appropriate disk drive PCP panel to OFF. Failure to remove power can result in personal injury.

1. Remove sector pulse and support assembly (chapter 2).

2. Using a cam disconnect tool, remove spring anchor and helical extension spring.

3. Remove 1/4- or 3/8-inch nut from sector pulse and support assembly pivot pin.

4. Loosen Allen screws that secure pivot pin to sector pulse block assembly.

5. Remove sector pulse pivot pin and compression spring from sector pulse and support assembly.

6. Remove sector pulse block assembly from support block.

7. Remove stop nut and nylon setscrew from old sector pulse block assembly and install in new sector

26. **DIRECTIVE TEXT**

A writing style in which sentences start with the imperative form of a verb, so the reader is commanded to perform an action.

Troubles which may prevent a centrifugal blower from performing its function generally involve damage to the rotor shaft, thrust bearings, turbine blading, nozzle ring, or blower impeller. Damage to the rotor shaft and thrust bearings usually occurs as a result of insufficient lubrication, an unbalanced rotor, or operation with excessive exhaust temperature.

Centrifugal blower lubrication difficulties may be caused by failure of the oil pump to prime, low lube oil level, clogged oil passages or oil filter, or a defect in the relief valve which is designed to maintain proper lube oil pressure.

If an unbalanced rotor is the cause of shaft or bearing trouble, there will be excessive vibration. Unbalance may be caused by a damaged turbine wheel blading, or by a damaged blower impeller.

Turbine blading damage in a centrifugal type blower may be caused by operating with an excessive exhaust temperature, by operating at excessive speeds, by bearing failures, by failure to drain the turbine casing, or by the entrance of foreign bodies.

Nozzle ring damage may be caused by excessive exhaust gas temperature, foreign bodies, and turbine blades which break loose.

27. DEDUCTIVE TEXT

A writing style in which facts relating to the operation or maintenance of equipment are presented as premises requiring the reader to bridge the gap between supplied information and unstated conclusions.

AD-A057 134 MARYLAND UNIV BALTIMORE COUNTY BALTIMORE F/G 5/9
SELECTING TECHNICAL INFORMATION PRESENTATION MODES ACCORDING TO--ETC(U)
MAR 78 T E POWERS N00014-76-C-1067
UNCLASSIFIED NL

3 OF 3
AD
A057 134

END
DATE
FILMED
9-78
DDC

4-100. MV/HV POWER SUPPLY.

4-101. GENERAL. The MV/HV power supply (T.O. 31S1-2TSQ91-63, fig 6) provides +15-kv and +500v power for the ppi and ARO crt. The +15-kv accelerating potential is supplied directly to both ppi and ARO crt. The +500v is supplied to the ppi and ARO intensity amplifiers to provide voltage for the cathode, accelerating electrode, and focusing anode of both ppi and ARO crt. The MV/HV power supply consists of timing circuits, power supply circuits, and regulator-sensor circuits.

4-102. The timing circuits contain a timing pulse generator that produces a timing pulse to control a HV switch-driver in the power supply circuits; a +15-kv error amplifier that produces an amplified error signal to control the duty cycle of the timing pulse from the timing pulse generator; a +500v overcurrent or ±15v fault protection circuit that disables the timing pulse generator when either an overcurrent condition occurs in the +500v power supply or a fault occurs in the -15v input power source.

28. CONTINUOUS TEXT

Text written in a normal prose style; a smooth narrative divided appropriately into paragraphs.

[illegible] REFERENCE ASSEMBLY

GENERATES A 144KHZ REFERENCE FREQUENCY FOR OVERALL SYSTEM TIMING. CONTAINS COUNTER DIVIDERS TO DIVIDE THE 144KHZ TIME BASE SIGNAL [illegible] FREQUENCIES REQUIRED.

PROVIDES FIXED REFERENCE CORRECTION SO BOTH RECORDER AND DIGITAL READOUT READ DEPTH BELOW THE KEEL RATHER THAN FROM BELOW THE TRANSDUCER. THIS IS ACCOMPLISHED BY ADVANCING THE KEYING SO TRANSMIT PULSES CAN OCCUR PRIOR TO THE DISPLAY ZERO DEPTH TIME.

PROVIDES LAMP DRIVE FOR FEET - FATHOMS INDICATORS, FLASHING BEER KEYING INDICATOR LAMP, AND DISCRIMINATOR LAMP WHICH AUTOMATICALLY FLASHES IN WATER LESS THAN 30 FEET.

PRODUCES A GATING SIGNAL AND A GATE TO PREVENT THE RECOGNITION OF A FALSE ECHO AND SOME TRANSMIT REVERBERATIONS BY THE DISPLAYS. A GATE IS INCLUDED TO ELIMINATE THE CHART TRANSMIT TIME ZERO MARK IN 600 FEET AND FATHOM SHORT PULSE RANGES. IT INCLUDES MEANS TO CHECK AND ADJUST CHART ZERO.

PROVIDES ELECTRONIC KEY PULSES FOR ELECTRONIC KEYING AND DISABLES THE RECORDER DRIVE WHEN ELECTRONIC KEYING MODE IS SELECTED. PROVIDES CIRCUIT TO DISABLE RANGE GATE WHEN IN SINGLE PING OPERATION.

① C-PWR-1

FILTERS AND DISTRIBUTES +8 VOLT POWER.

② TRACKING PULSE DISABLE GATE

E-INV-1 INPUT IS LOW IN AUTO, ALLOWING OUTPUT TO BE TRACKING PULSE NO. 2. WHEN THE AUTO PING SIGNAL IS HIGH, OUTPUT IS LOW, SHORTING OUT THE TRACKING PULSE TO DISABLE THE RANGE GATE IN SINGLE PING.

③ 144KHZ OSCILLATOR

CRYSTAL CONTROLLED TRANSISTOR OSCILLATOR PROVIDES A 144KHZ REFERENCE FREQUENCY FOR ALL TIMING CIRCUITS IN THE ASSEMBLY.

④ ÷2 COUNTER NO. 1

E-FF-1 IS TOGGLED BY NEGATIVE GOING EDGE OF Q OSC-1 OUTPUT. E-FF-1 OUTPUT IS A 72KHZ SQUARE WAVE WHICH IS USED AS A STARTING POINT FOR ALL SUBSEQUENTLY USED FREQUENCIES.

⑤ ADVANCE KEYING PULSE GENERATOR

E-[illegible]-1 GENERATES A POSITIVE 50USEC PULSE EACH TIME ONE OF THE ADVANCED KEYING PULSE INPUTS IS ALTERNATELY GROUNDED BY THE [illegible] A2B-E AND A2B-F OPERATE TOGETHER AS A FLIP-FLOP THAT REMEMBERS WHICH INPUT WAS PREVIOUSLY GROUNDED. CR 6R CR 7 MOMENTARILY PASS THE GROUND CHANGE SENSED BY THE FLIP-FLOP TO A2B-A TO FORM A PULSE OUTPUT. THE DURATION OF THE PULSE IS CONTROLLED BY THE TIME REQUIRED FOR R10, R11, AND A2C-A TO RECHARGE C8 AND C9 SUFFICIENTLY TO RETURN E [illegible] A2C-A INPUTS TO HIGHS. E-[illegible]-2 AND E-[illegible]-3 INVERT THE ADVANCE KEY PULSE FROM A2C-A TO FORM THE TWO NEGATIVE GOING DATA STROBE PULSES.

29. SEGMENTED TEXT

Text written as a series of short statements in which the theme in each statement does not necessarily relate to that in the following statement.

INDEX

30. RETRIEVAL-ORIENTED LIST

A list provided to aid the reader in locating information in the document, e.g., tables of contents, lists of illustrations, and indices.

GLOSSARY

Special computer terms and their specific meanings as applied to this computer are given below.

ABORT—The condition in the computer that results in the skipping of the next sequential instruction.

ACCESS TIME—The time interval, characteristics of a memory or storage device, between the instant information is requested from memory and the instant the next request for information from memory can be made.

ACKNOWLEDGE—Indication of the status of data on the input/output lines. Abbreviated as ACK.

ADDRESS—A coded number that specifically designates a computer register or other internal storage location. Information is referenced by its address. Portions of computer control are responsible for directing information to or from an addressed location.

ADDRESSABLE—Capable of being referenced by an instruction; e.g., Enter A (f = 11).

ARITHMETIC—A section within the computer where reasonable processes such as addition, subtraction, multiplication, and division are performed, and operands and results are stored temporarily.

BIT PLANE—Two memory boards that contain the same relative bit position for each of 32,768 memory locations. Bit position is defined by the associated stage in the Z register. Bit plane control is concerned with the parallel transmission (flow) of information into and out of memory on a bit plane level.

BOOTSTRAP—A routine, normally input, contained in the 16-word wired memory.

BORROW—A borrow in subtraction is the additional subtraction of a one from the next partial difference and is initiated when a digit of the minuend is zero and the corresponding digit of the subtrahend is one. In a binary system of modules $2^k - 1$, where k is the number of stages in a register, the borrow produced from the leftmost digit $2^k - 1$ of the minuend is called the end-around borrow. A final correction is made by applying the end-around borrow to the partial difference of the rightmost digits.

BRANCH POINT—A point in a program or instruction where a decision is made on the basis of arithmetic results. The result of the decision indicates whether the main program is to be continued or branched to a different program. See also JUMP.

31. GLOSSARY/ABBREVIATIONS

A list of definitions of unfamiliar words, abbreviations, acronyms, symbols, or other unique items.

Reference Designation	Name and Description
U16	Integrated Circuit: MFR 15238, P/N MIC962-5D
U17	Same as 3A1A1U2
U18	Same as 3A1A1U12
U19	Crystal Oscillator: MFR 14986, P/N UQ6C19.2K-BL-5
U20 to U23	Same as 3A1A1U1
U24	Same as 3A1A1U2
3A1A2	M/DU Control: MFR 14304, P/N 0240-5410
C1, C2	Capacitor, Fixed Tantalum, 39 uF, 10V: Mil type M39003/01-2019
C3	Capacitor, Electric, 10 uF, 16V: MFR 56289, P/N TE1155
CR1	Diode: Mil type 1N3611
R1	Resistor, Fixed Composition, 47K: Mil type RCR07G474JR
R2	Resistor, Fixed Composition, 18K: Mil type RCR07GF183JR
U1	Integrated Circuit: MFR 15238, P/N MIC946-5D
U2	Integrated Circuit: MFR 04713, P/N MC1810L
U3	Integrated Circuit: MFR 01295, P/N SN7496J
U4	Integrated Circuit: MFR 15238, P/N MIC934-5D
U5	Integrated Circuit: MFR 01295 P/N SN7493J
U6	Integrated Circuit: MFR 15238, P/N MIC945-5D

32. MATERIALS LIST

A list of parts, tools, controls, displays, test equipment, or other set(s) of items used in operating or maintaining equipment.

AREA	FROM CONN	PIN	AREA	TO CONN	PIN	FUNCT UNIT		SIGNAL
J	005	039	05	XA	043	052	XD		KEYALPH
J	005	040	05	XA	043	075	XD		KEYCLR
J	005	041	02	XA	034	045	XD		CPCCLR
J	005	048	05	XA	037	006	M		DSTR8D1
J	005	049	05	XA	037	005	M	R	DSTR8D1
J	005	050	05	XA	037	L3	M	•	DSTR8D1
J	005	051	05	XA	037	017	M		DSTR8D2
J	005	052	05	XA	037	016	M	R	DSTR8D2
J	005	053	05	XA	037	021	M		DSTR8D3
J	005	054	05	XA	037	020	M	R	DSTR8D3
J	005	055	05	XA	037	049	M	•	DSTR8D3
J	005	056	05	XA	037	008	M		DSTR8D4
J	005	057	05	XA	037	007	M	R	DSTR8D4
J	005	058	05	XA	037	019	M		DSTR8D5
J	005	059	05	XA	037	018	M	R	DSTR8D5
J	005	060	05	XA	037	047	M	•	DSTR8D5
J	005	062	05	XA	037	045	M	•	DSTR8D2
J	005	063	05	XA	037	012	M		DSTR8D6
J	005	064	05	XA	037	011	M	R	DSTR8D6
J	005	065	05	XA	037	043	M	•	DSTR8D6
J	005	067	05	XA	037	037	M	•	DSTR8D4
J	005	068	05	XA	037	023	M		DSTR8D7
J	005	069	05	XA	037	022	M	R	DSTR8D7
J	005	070	05	XA	037	051	M	•	DSTR8D7
J	005	071	05	XA	037	010	M		DSTR8D8
J	005	072	05	XA	037	009	M	R	DSTR8D8
J	005	073	05	XA	037	041	M	•	DSTR8D8
J	005	080	05	XA	043	036	XD		PRVIDEO
J	005	081	05	XA	043	050	XD		DVLOC
J	005	082	05	XA	043	035	XD		HOSTFND
J	005	083	05	XA	037	032	XD		WLOOFF
J	005	084	05	XA	043	076	XD		REFHILO
J	005	085	05	XA	043	058	XD		PCOARSE
J	005	086	05	XA	045	032	XD		WLINE
J	005	088	05	XA	043	061	XD		PUSFINE
J	005	089	05	XA	043	048	XD		MCOARSE
J	005	090	05	XA	043	028	XD		6-12HND
J	005	091	05	XA	043	022	XD		MINFINE
J	005	092	05	XA	043	057	XD		MHADJ
J	005	093	05	XA	043	019	XD		SGLDHL
J	005	094	05	XA	043	021	XD		PZONE

33. WIRE LIST

A list of wiring connections for point-to-point wire checking, listing origin of signal, location of connection, and destination of output in a simple coded format.

Step	Operation of Test Equipment	Point of Test	Control Settings and Operation of Equipment	Performance Standards
3	...	SIF-P/SIF UNIQUE readout	a. Set NED thumb-wheels to 11111 b. Press ENTER 3 pushbutton c. Momentarily press READOUT 3 pushbutton d. Press ENTER 3 pushbutton off	SIF-P/UNIQUE readout shall display 11111
4	...	SIF-P/SIF UNIQUE readout	a. Set NED thumb-wheels to 14444 b. Press ENTER 4 pushbutton c. Momentarily press READOUT 4 pushbutton d. Press ENTER 4 pushbutton off	SIF-P/UNIQUE readout shall display 14444
5	...	SIF-P/SIF UNIQUE readout	a. Set NED thumb-wheels to 25555 b. Press ENTER 5 pushbutton c. Momentarily press READOUT 5 pushbutton d. Press ENTER 5 pushbutton off	SIF-P/UNIQUE readout shall display 25555

34. PROCEDURES TABLE

A tabular format used to organize procedures into a logical sequence. Reference data in the table are usually organized in columnar form.

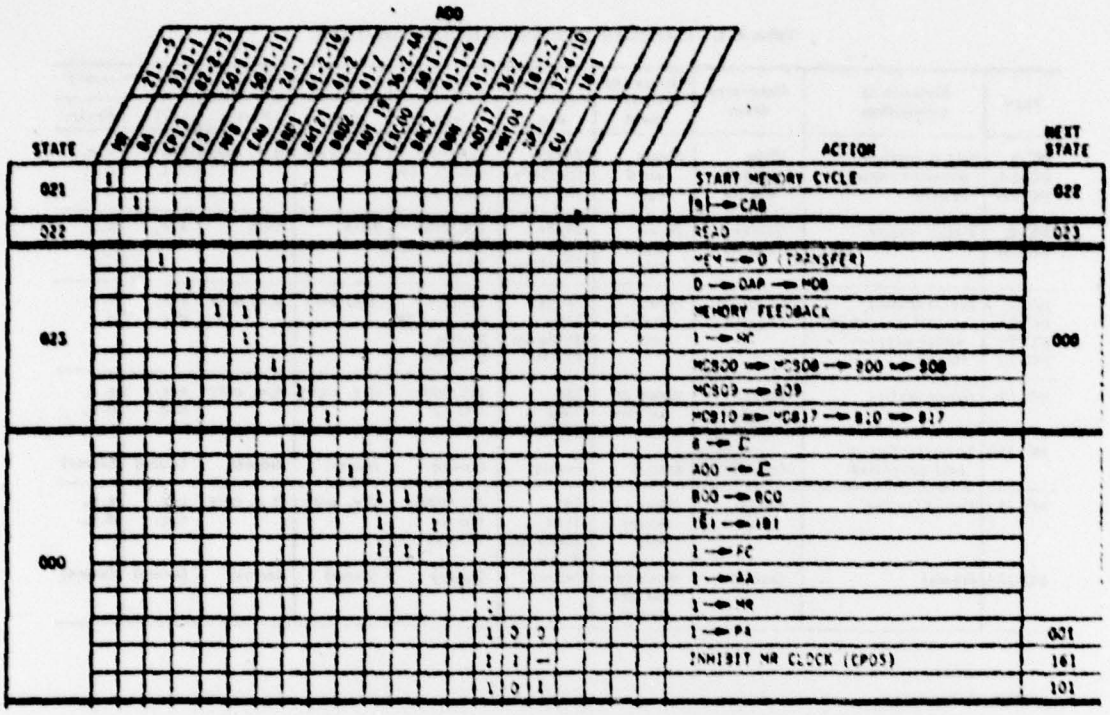
Table 6-1. – Characteristics of mobile electric powerplants.

Type	Methods of propulsion	Generator drive	Operating environment	Power ratings		Starting Power		Service power	
				d.c.	a.c.	Jet	Recip.	Jet	Recip.
MC-5, MC-5A, MC-5B	Self-propelled gasoline engine vehicle	Main vehicle engine	Shore based only	28/35v 200/500a 1000a int	115/200v 400 Hz, 3ϕ 30/45 kva	d.c. only	d.c. only	a.c. d.c.	a.c. d.c.
MC-6, MC-6A	Towed trailer	Gasoline engine	Shore based only	28.5v 200a 32/45 kw	120/208v 400 Hz, 3ϕ 30 kva	DNA	DNA	a.c. d.c.	a.c. d.c.
MC-7, MC-7A, MC-7B, MC-7C	Towed trailer, or self-propelled within narrow limits	Gasoline engine	Shore based only	28.5v 750a 1000a int 45 kw	115/200v 400 Hz, 3ϕ 35 kva 0.75 PF	d.c. only	d.c. only	a.c. d.c.	a.c. d.c.
MC-10	Towed trailer	Diesel engine	Shore or carrier based	28v 750a 1000a int	115/200v 400 Hz 90 kva	d.c. only	d.c. only	a.c. d.c.	a.c. d.c.
MC-10A	Towed trailer or self-propelled	(same)	(same)	(same)	(same)	(same)	(same)	(same)	(same)
MC-12	Towed trailer	Diesel engine	Shore based only	28v 750a 1000a int 45 kw	115/200v 400 Hz 125 kva	d.c. only	d.c. only	a.c. d.c.	a.c. d.c.
MC-12A	(same)	(same)	Shore or carrier based	(same)	(same)	(same)	(same)	(same)	(same)

35. SPECIALIZED DATA TABLE

Information condensed into a table pertaining to a specialized area of knowledge. Tabular formats have one primary axis (column or row headings) while matrices use two axes in order to locate a cell containing the desired information. As a result, cells in matrices are more likely to contain numbers and symbols, while cells in tables are more likely to contain words.

APPENDIX E (cont'd)



36. SPECIALIZED DATA MATRIX

Information condensed into a matrix pertaining to a specialized area of knowledge. Tabular formats have one primary axis (column or row headings) while matrices use two axes in order to locate a cell containing the desired information. As a result, cells in matrices are more likely to contain numbers and symbols, while cells in tables are more likely to contain words.

APPENDIX E (cont'd)

DESCRIPTION	PAGE NO.	FUNCTIONAL BLOCK DIAGRAM PAGE NO.	FUNCTIONAL BLOCK DIAGRAM TEXT PAGE NO.	SCHEMATIC DIAGRAM PAGE NO.	SCHEMATIC DIAGRAM TEXT PAGE NO.	MDC OR MAINTENANCE DATA PAGE NO.
INDEX EXPLANATION OF CODES, SHADES, SYMBOLS	2	—	—	—	—	—
MANUAL DESCRIPTION	3	—	—	—	—	—
INTEGRATED CIRCUIT DATA	4	—	—	—	—	—
HOW TO USE MDC'S	6	—	—	—	—	—
EQUIPMENT DESCRIPTION	8	—	—	—	—	—
OPERATORS DATA	10	—	—	—	—	—
FUNCTION DESCRIPTION	—	15	14	—	—	—
SYSTEM LEVEL MDC	—	—	—	—	—	16, 17
POWER DISTRIBUTION	—	19	18	—	—	18
SYNCHRONIZER FUNCTION	—	21	20	—	—	22, 23
TRANSMIT FUNCTION	—	25	24	—	—	26, 27
RECEIVE-RECORD FUNCTION	—	29	28	—	—	30, 31
DIGITAL DISPLAY FUNCTION	—	33	32	—	—	34, 35
DIGITAL TO ANALOG CONVERTER FUNCTION	—	37	36	—	—	36
REMOTE INDICATOR FUNCTION	—	81	80	81	80	81
UNIT 1 RECEIVER-TRANSMITTER RT-868/UGN-4	—	—	—	—	—	—
1A1 ENERGY STORAGE ASSY	—	25	24	43	43	42
1A2 ENERGY STORAGE ASSY	—	25	24	43	43	42
1A3 POWER CHASSIS	—	19, 25, 29	18, 24, 28	43	43	42
1A4 CARD FILE	—		—	—	—	—
1A4A1 RECEIVER ASSY	—	29	28	45	45	44
1A4A2 RECEIVER CONTROL ASSY	—	29	28	47	47	46
1A4A3 REFERENCE ASSY	—	21, 25, 29, 33	20, 24, 28, 32	49	48	50, 51
1A4A4 SYNCHRONIZER ASSY	—	21	20	53	53	54, 55
1A4A5 KEYING CONTROL ASSY	—	25	24	57	56	58, 59
1A4A6 TRACKING CONTROL ASSY	—	33	32	61	60	62, 63
1A4A7 TRACKING CONTROL ASSY	—	33	32	61	60	62, 63
1A4A8 READOUT CONTROL ASSY	—	33	32	65	64	66, 67
1A4A9 READOUT CONTROL ASSY	—	33	32	65	64	66, 67
1A4A10 SLAVE READOUT BUFFER	—	33	32	69	68	68
1A4A11 T-R NETWORK	—	25, 29	24, 28	43	43	42
1A4A13 SIGNAL PROCESSOR	—	21, 25, 29	20, 24, 28	71	70	70

37. RETRIEVAL-ORIENTED MATRIX

A matrix provided to aid the reader in locating information in the document. Information on two axes is used to locate cells containing page, paragraph, or section numbers.

APPENDIX F

Navy Technical Information Presentation Program
Survey Form: T-TT
Questionnaire Number _____

Instructions

The purpose of this questionnaire is to obtain your ideas about effective ways of presenting technical information YOU might need to complete maintenance/operator jobs on Navy equipment or hardware. The information you provide in this questionnaire is in support of the Navy Technical Information Presentation Program, a CNO-sponsored program to improve the quality of presentation of technical data used by Fleet technicians. Your cooperation in this effort is very much appreciated.

The attached pages contain twelve different classifications of technical information you might need to do maintenance/operator work in the Fleet. You are asked to indicate in the space provided the most effective way(s) the information should be laid out (presented) for it to be helpful to YOU. Please keep in mind the following in responding to the questions:

1. Indicate how YOU want each classification of technical information presented. Do NOT respond in terms of what you think other personnel in your rating (e.g., very experienced, very inexperienced, etc.) might need. Answer for YOU only.

2. Try to be as specific and concise as possible in each response. For example, "a drawing containing printed names of parts, with accompanying text which explains the function of each part" is an example of a brief and concise response.

3. Use the names of specific categories of presentation formats (e.g., photograph, drawing, etc.) as appropriate. Names of format categories, and examples of types of each category, are in the handout you received. Don't feel totally tied to the formats in the handout (or to the examples), but if a format name is appropriate, please use it.

4. If for any of the twelve classifications of technical information YOU don't need the information presented to you (because you already know it) please put "None" in the space provided. "None" simply means that normally YOU don't need that kind of technical information laid out (presented) at the time you're performing technical job tasks.

Thank you again for your cooperation.

APPENDIX F (cont'd)

Personnel Characteristics

Rating _____ Pay Grade _____

Age _____ Sex _____

Basic Test Battery Scores: GCT _____ ARI _____ MECH _____

Number of Years of active Navy Service _____

Highest level of Civilian education completed (check one):

_____ Less than 8th grade

_____ Less than 12th grade

_____ High school graduate (including H.S. GED)

_____ Some college, but less than 4 years

_____ Graduate of 4 Year College Program

_____ Some graduate work, but no graduate degree

_____ Graduate degree (for example, M.A., Ph.D., etc.)

APPENDIX F (cont'd)

FORMAT CATEGORIES AND FORMAT TYPES

A. PHOTOGRAPH

1. photograph
2. airbrushed photograph

B. DRAWING

3. airbrushed drawing
4. sketch
5. engineering drawing
6. two-dimensional view drawing
7. three-dimensional view drawing
8. assembled view drawing
9. disassembled (exploded) view drawing
10. cut-away view drawing

C. DIAGRAM

11. overall block diagram
12. detailed block diagram
13. schematic diagram
14. wiring diagram
15. cabling diagram
16. functional signal flow diagram
17. digital logic diagram
18. blocked schematic diagram
19. blocked digital logic diagram
20. pictorial block diagram
21. timing diagram
22. maintenance dependency chart
23. decision tree

D. GRAPH

24. waveform
25. graph

E. TEXT

26. directive text
27. deductive text
28. continuous text
29. segmented text

F. TABLE

30. retrieval-oriented list
31. glossary/abbreviations
32. materials list
33. wire list
34. procedures table
35. specialized data table

G. MATRIX

36. specialized data matrix
37. retrieval-oriented matrix

FORMAT CATEGORIES: A to G

FORMAT TYPES: 1 to 37

APPENDIX F (cont'd)

Technical Information Classifications

1. Theory and principles of operation of equipment/hardware, its components, or component parts.

2. Procedures: That is, procedures for assembly/disassembly, trouble-shooting, testing, maintenance, etc. of equipment/hardware.

3. Nomenclature, terms, codes, and jargon, in one's occupational specialty.

Technical Information Classifications (cont'd)

4. Basic safety rules or special safety precautions for working on equipment/hardware.

5. Names of hand tools and testing equipment used in conjunction with maintenance jobs on equipment/hardware.

6. Connections and functions of components and component parts (e.g., electrical/electronic circuit arrangements; hydraulic/pneumatic flows through pumps, valves, etc.; or mechanical arrangements of gears, shafts, levers, etc.)

Technical Information Classifications (cont'd)

7. Fundamental facts, basic names, and locations of components and component parts of equipment/hardware.

8. How components and component parts relate to the entire equipment/hardware system.

9. The functions of components and component parts of equipment/hardware.

Technical Information Classifications (cont'd)

10. The meaning of technical symbols, acronyms and abstract terms.

11. Calibrations, settings, torques, clearances, etc.

12. How to use hand tools and testing equipment in maintaining equipment/ hardware.